Psychosocial factors in the stress-coping process in children: Harnessing resilience in the face of adversity

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Psychosocial factors in the stress-coping process in children: Harnessing resilience in the face of adversity

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Abstract

Background: A range of psychosocial factors have been linked to the development of resilience or vulnerability to stress, including early life experience, personality, social support, coping strategies, cognitive skills, and demographic factors. Research is divided regarding the relative impact of these factors on resilience; focused research is needed to elucidate the findings related to psychosocial processes, stress reactivity and resilience.

Aims: The overall aims of the current programme of research were to provide a fuller understanding of children's psychological and physiological responses to stress, the coping strategies they use, and to investigate specific psychosocial factors which lead to stress resilience or vulnerability in children. To investigate the first aim, an adapted social stressor, the Bath Experimental Stress Test for Children (BEST-C), was developed and assessed.

Methods: The research used a mixed methods approach; an embedded and multiphase research design, across the three studies. Each study utilised both qualitative and quantitative data collection methods with children aged seven to 11 years. These encompassed interviews, questionnaires, a novel experimental laboratory task (BEST-C), and the collection of biological samples (salivary cortisol and heart rate).

Main findings: In study one, the BEST-C was found to be an effective method for inducing a cortisol response in children. This study also found three distinct patterns of response to the BEST-C suggesting that children do not all respond to stress in the same way. In study two, four themes were found in the analysis of interviews about stress: navigating the social minefield, pressure to thrive in the modern world, fear of the unknown, and learning life's lessons. In study three a significant increase in cortisol was found in the anticipation period prior to participants completing the BEST-C, suggesting that the thought of the task was stressful. However, no significant increase in response to the task was observed due to an unintended stress-buffering experimenter effect. This programme of research has clarified children's psychological and physiological responses to an acute stressor and highlighted some of the key psychosocial factors, such as social support and the use of multiple coping strategies, involved in the development of stress resilience.

List of abbreviations

ACTH: Adrenocorticotropic hormone

ALSPAC: Avon longitudinal study of parents and children

ANS: Autonomic nervous system

BEST-C: Bath experimental stress test for children

BMI: Body mass index

BPS: British Psychological Society

CAQDAS: Computer assisted qualitative data analysis software

CAMHS: Child and adolescent mental health services

CAR: Cortisol awakening response

CO^2: Carbon dioxide

CRH: Corticotrophin releasing hormone

DHEA: Dehydroepiandrosterone

ELA/ELS: Early life adversity/early life stress

EMDR: Eye movement desensitisation and reprocessing

GAS: General adaptation syndrome

HR/HRV: Heart rate/heart rate variability

HPA: Hypothalamic-pituitary-adrenal axis

LEI: Life events interview

MANOVA/MANCOVA: Multivariate analysis of variance/covariance

PNEC: Psychoneuroendocrinology (journal)

PNI: Psychoneuroimmunology

PSRP: Preconception stress and resiliency pathways

PSS: Perceived stress scale

PTSD: Post-traumatic stress disorder

SAM: Sympathetic adrenomedullary pathway

SES: Socioeconomic status

SEN: Special educational needs

SET: Social evaluative threat

SNS: Sympathetic nervous system

SRRS: Social readjustment rating scale

TA: Thematic analysis

TSST: Trier social stress test (also see: adaptations for children (TSST-C), groups (TSST-G), utilising a friendly panel (f-TSST), and a virtual reality environment (VR TSST))

URI: Upper respiratory infections

Chapter one: Introduction

1.1 Chapter overview

This chapter will contextualise the topics of relevance to the programme of research outlined in this thesis. Relevant literature will be briefly stated although a fuller review of the literature can be found in chapter two. The literature highlights a clear gap in the research in regards to how psychosocial factors and stress experiences lead to the development of stress resilience or vulnerability, and how these factors relate to children's responses to acute social stress. The research presented in this thesis is embedded within the discipline of child health psychology, and incorporates aspects of other approaches such as the life course perspective and psychoneuroimmunology (PNI). Definitions are given for the key terms used in this thesis, specifically stress, coping and resilience. The overall aims and research questions of this programme of research will be discussed together with the individual objectives of each of the three studies undertaken. The remainder of this chapter will provide a synopsis of the seven chapters within this thesis.

1.2 Psychosocial factors in the stress-coping process in children: Harnessing resilience in the face of adversity

Stress is an unavoidable part of life; it is something that people learn to cope with in order to survive and thrive. If stress is not managed appropriately it can lead to negative physical and psychological effects later in life. Therefore learning to cope with stress is particularly important in childhood so as to prevent these negative effects from occurring in adulthood (Strahler, Mueller, Rosenloecher, Kirschbaum, & Rohleder, 2010). Over the last four decades researchers have become increasingly interested in the psychosocial factors which lead to good and bad outcomes in adulthood, specifically in the development of stress resilience and vulnerability (Masten, 2014). Psychosocial factors that have been linked to stress resilience and vulnerability include personality and temperament, social support, coping strategies, cognitive skills, and demographic factors. Early life experiences of stress and adversity (ELS/ELA) also play a role in the development of resilience.

Exposure to mild stress or adversity can be beneficial for development, however it is likely to be detrimental when the stressors are severe or chronic. Some researchers have suggested that childhood experiences of adversity can permanently alter the stress response so that individuals are less able to cope with future stressors, for example, through the

hypothalamic-pituitary-adrenal (HPA) axis and levels of the stress hormone cortisol (Gunnar, Frenn, Wewerka, & Van Ryzin, 2009; Lovallo, 2013). A systematic review of the consequences of childhood adversity established that 27 out of the 30 studies reviewed found "a signficant effect of adversity on the cortisol response to stress" (Hunter, Minnis, & Wilson, 2011, p. 614).

The stress response system can be activated by physical or psychological threats, for example social stress, which can induce a threat to an individual's social self. Stress activates psychobiological responses which can be adaptive in terms of enhancing one's ability to detect a threat and responding appropriately, but can also have a negative impact on physical and mental health if these threats are chronic or prolonged (Dickerson, Gruenewald, & Kemeny, 2009). Therefore, research using social stress testing in adults and in children has increased, as researchers have endeavoured to discover how different populations are affected by these tasks, and which psychosocial factors improve or reduce an individual's ability to cope with such stress, leading to stress resilience or vulnerability.

There is an ongoing debate as to what makes some people resilient to stress and others vulnerable. Research has suggested that individual differences such as temperament, family attributes and difficult living conditions can impact on whether children are resilient or vulnerable to stress (Ehlert, 2013; Smith & Prior, 1995; Turner-Cobb, Rixon, & Jessop, 2011). Smith and Prior (1995) used child, parent and teacher measures of individual differences to investigate which factors best predicted whether children who had experienced "severe psychological stress" were resilient or vulnerable to stress (p.168). Temperament and negative life events featured as important factors in differentiating between children who were resilient and those who were not.

The research evidence is divided about the impact of childhood stress on resilience; some research suggests that it can have a positive effect (and lead to resilience) whereas other research suggests that early life stress can have a negative effect. Experiences of adversity, such as the stress associated with the transition to school, can have a positive impact on children's stress responses, resilience, and health outcomes (Turner-Cobb et al., 2011). Other research has highlighted potential negative consequences of early life stress and adversity, such as adverse effects on cognitive functioning, emotional and physical development (Ehlert, 2013) and on the body's stress response (Hunter et al., 2011).

Stress responses, resilience factors such as coping, and health outcomes in children are all interconnected, and can impact each other in a series of bidirectional relationships. Most of the research has focussed on one or two of these relationships, for example the

impact of psychosocial factors on stress responses or their impact on resilience. Therefore, more research that investigates all aspects of these relationships is needed, e.g. studies which examine the effects of psychosocial factors on both stress responses and resilience. The present programme of research intends to address this gap in the research by examining these relationships in a population of healthy children. In order to address this gap in the literature an acute social stressor is required, such as the laboratory based social stress tests discussed briefly above (and discussed more extensively in chapter three and chapter four). These tests have been widely used in adults but findings are inconsistent in research with children, therefore a more meaningful stress testing task is required to truly understand children's responses to acute social stress.

When measuring children's physiological response to an acute stressor it is also important to take into account their subjective stress experience, both in terms of how they cope with the stress task and how they cope more generally. It is also important to consider the levels of stress children have experienced in their lives. This would enable a more comprehensive overview of how stress experiences and psychosocial factors interact and lead to stress resilience or vulnerability in children. Learning how to successfully cope with stress during childhood is a particularly useful psychosocial skill for dealing with future life stress. Although there is a wealth of research suggesting which types of coping are the most effective, "determining which coping strategies prove more efficacious for stress reduction and better adjustment is still a contentious issue" (Aldridge & Roesch, 2007, p. 118). Therefore, there is a need for more research into coping with adversity, along with other relevant psychosocial factors, which affect stress and resilience.

1.3 Key research approaches and academic disciplines

This programme of research incorporates several approaches and academic disciplines; most broadly the research falls within the child health psychology discipline, but also combines features of the life course perspective and psychoneuroimmunology (PNI).

Child health psychology is defined as "the specific application of health psychology research and practice to physical health in children, as well as the implications and applications of psychosocial influences during childhood development on subsequent health in adulthood" (Turner-Cobb, 2014, p. 4). The present research places particular emphasis on the latter part of the definition referring to the impact of psychosocial factors. Similarly, the life course perspective emphasises the importance of childhood experiences

on adult physical and mental health outcomes, as "early life experiences can shape health across an entire lifetime" (Braveman & Barclay, 2009, p. 5163). These experiences can have a positive or negative effect, depending on which outcomes are being measured, and situational and individual factors which can act as psychosocial moderators between stress and health.

PNI is a field of research which "focuses on the relationships between psychosocial processes and the activities of the nervous, endocrine, and immune systems" (Sarafino, 2008, p106). Psychological factors can impact hormonal and nervous system activations, which can in turn alter immune function, and thereby susceptibility to disease (Turner-Cobb, 2014). A useful model combining PNI and health psychology approaches has been developed by Lutgendorf and Costanzo (2003) to elucidate the relationships between psychosocial processes, biological factors and health outcomes. This model will be discussed in more detail in chapter two. The current programme of research focuses on how psychosocial factors impact stress hormones such as cortisol. It was outside the scope of this project to focus on the longitudinal impact of stress on the health of participants, therefore the immunology aspect of PNI is not focussed on in this thesis.

1.4 Defining stress, coping, and resilience

Definitions of stress can be stimulus-based, response-based or transactional (i.e. the transaction between person and environment) (Forman, 1993). The majority of researchers use transactional definitions and this is the characterisation of stress taken in this thesis. The most widely accepted definition of stress is that it is "a relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" (Lazarus & Folkman, 1984, p. 21).

For concepts such as coping it is important for a researcher to clarify which definition of the concept they adhere to, as numerous definitions are available in the literature. However many researchers do not explicitly state a definition, for example in a review of the coping literature Garcia (2010) found that less than half of the 59 articles reviewed defined coping and 16 articles did not make any reference to which coping theory they were basing their research on. The current research supports the definition provided by Lazarus and Folkman (1984) which defines coping as the "constantly changing cognitive and behavioural efforts to manage specific external and/or internal demands" (Lazarus & Folkman, 1984, p. 141). The definitions of stress and coping encompass the

process of stress appraisal which helps explain why people respond to the same stressor in very different ways, namely due to their perception of how stressful or threatening it is.

There are a number of definitions of resilience, however the majority of these classifications make reference to overcoming stress or adversity, for example "the capacity of a dynamic system to adapt successfully to disturbances that threaten system function, viability, or development" (Masten, 2014, p. 10). This viewpoint suggests that resilience is not a trait that people either possess or do not possess, but rather that it develops over time through an interaction between a person and their environment (Egeland, Carlson, & Sroufe, 1993). Therefore stress vulnerability can be seen as the "flipside" to stress resilience (Karatsoreos & McEwen, 2013, p. 2).

1.5 Aims, research questions and objectives of the research

The overall aims of the current programme of research were to provide a fuller understanding of children's psychological and physiological responses to stress and how they cope with stress, as well as investigating the specific psychosocial factors which lead to stress resilience or vulnerability in children. Therefore, the primary research questions under investigation in this thesis were:

- What is the effect of the BEST-C (an adapted acute social stressor) on children's stress responses? (study one and three)
- What are children's experiences of stress and early life adversity? (study two)
- What psychosocial factors are involved in developing resilience to stress in children? (study two and three)

The main objective of study one was to develop a modified social stress test designed to create a more meaningful stress environment for children by enlisting age-matched peers rather than adults on the panel, and to assess participants' physiological arousal to this stressor through salivary cortisol and self-reported stress.

The primary objective of study two was to develop a better understanding of the differences between stress-resilient children and children who were more vulnerable to stress (with a focus on psychosocial factors). Data was collected through in-depth interviews with children and their parents on the topics of stress, coping and resilience.

The data collected in study two was used to categorise participants into four stress-resilience groups: high resilience/high stress, high resilience/low stress, low resilience/high stress, and low resilience/low stress. The chief objective of study three was to compare the

stress responses of children in the four stress-resilience groups to the same acute stressor developed in study one, in order to investigate differences between these groups in terms of stress responses and coping.

1.6 Structure of the thesis

1.6.1 Chapter one: Introduction

As described in the overview at the beginning of this chapter, the background to this programme of research and the gap in the research that it aims to fill has been outlined. The main approaches, relevant academic disciplines and definitions have been discussed, as well as the overall aims and individual study objectives. This chapter will go on to give a brief overview of the contents of each chapter in the thesis.

1.6.2 Chapter two: Literature review

The literature review chapter gives an overview of the main theoretical approaches of stress, coping and resilience research, with an emphasis on the theories utilised in the present research, such as the transactional model of stress and coping (Lazarus & Folkman, 1984). A detailed description of the physiological stress response was provided, which informs the collection of salivary cortisol in the present research as a measure of the impact of psychosocial stress on the body's stress hormones. This chapter also reviews the research which has investigated the effects of a range of psychosocial factors on health, stress responses, and resilience. These psychosocial factors include experiences of early life adversity, personality and temperament, social support, coping strategies, cognitive skills, and demographic factors.

1.6.3 Chapter three: Methodology

The methodology chapter begins with a discussion of quantitative, qualitative and mixed methods epistemologies, and provides a justification for the use of a mixed methods approach in the present research. The chapter also details the methods that have been used in previous research to collect data on stress and coping, for example experimental lab testing, biological sampling, questionnaires and interviews. The methods for analysing and integrating quantitative, qualitative and mixed methods data were also discussed, along with practical issues regarding conducting research with young children, and ethical considerations.

1.6.4 Chapter four: Study one

Chapter four is the first of three data chapters and focusses on the development and testing of a social stress test, the Bath Experimental Stress Test for Children (BEST-C). Thirty-three participants completed the BEST-C and gave four saliva samples throughout, as well as completing questionnaires (about stressful life events, daily hassles and coping strategies) and an interview (about their experience of the stress test). The findings from study one revealed an increase in children's cortisol levels in response to the stressor, suggesting that the BEST-C is a meaningful stress testing paradigm for children. The study findings also emphasised the importance of collecting qualitative data about children's stress experiences as well as biological measures.

1.6.5 Chapter five: Study two

Chapter five and chapter six outline the methods and findings of a two-part study using the same group of participants. In study two, 38 children completed questionnaires about stressful life events, daily hassles, coping, illness and early life stress; and their responses to these questionnaires were used as a topic guide during semi-structured interviews with the participants. These in-depth interviews were carried out with children and their parents investigating children's experiences of stress and illness, and the coping strategies they use to deal with stress. The interviews were analysed using thematic analysis which produced four themes: navigating the social minefield, pressure to thrive in the modern world, fear of the unknown and learning life's lessons.

1.6.6 Chapter six: Study three

This chapter discusses study three, the second in a two-part study. The interviews from study two were coded into four groups based on children's experiences of stress and the resilience characteristics they displayed. These four stress-resilience groups were high resilience/high stress, high resilience/low stress, low resilience/high stress, and low resilience/low stress. Thirty-four of the 38 participants from study two took part in the BEST-C during which heart rate was measured and salivary cortisol samples were collected. The questionnaire data from study two was included in the analysis of this study and the participants were interviewed post-stressor. The findings from study three showed no increase in cortisol in response to the BEST-C, contrary to the findings in study one. The explanation provided for this finding was that the researcher had developed a rapport with participants when interviewing them in study two. Therefore, when the same

researcher then played the role of experimenter in study three they inadvertently provided social support to participants, and in doing so reduced children's stress responses to the BEST-C.

However, this does not mean that the BEST-C is not an effective stressor; an increase in cortisol was found during the anticipation period in study three and children self-reported that they found the task stressful. The findings from study one were not replicated because of an inadvertent yet valuable adaptation to the paradigm, not because the paradigm itself was ineffective. The researcher provided the participants with social support, a psychosocial factor which is known to reduce stress. Differences were found between the four stress-resilience groups suggesting that experience of stress and resilience factors are beneficial for coping with an acute social stressor.

1.6.7 Chapter seven: Overall discussion

The final chapter in this thesis provides an overview of the results from each of the three studies and applies these findings to the three research questions outlined at the beginning of this chapter and relevant theory. Strengths and limitations of the overall programme of research were discussed and recommendations were made for future research and potential applications of this research. The chapter ends with a summary of the thesis.

Chapter two: Literature review

2.1 Chapter overview

This chapter aims to outline the broader research area within which the programme of research presented in this thesis is placed. The chapter begins with an overview of the relevant stress, coping and resilience theories, thereby highlighting the theoretical basis for this research. This is followed by a detailed description of the body's physiological response to stress. The stress response, and cortisol in particular, is a key feature of two of the present research studies. The discussion then focuses in on the range of psychosocial factors which impact the dynamic and bidirectional relationships between stress, health and resilience. These psychosocial factors are grouped into four areas: life stress, psychosocial processes including individual differences (e.g. personality) and resources (e.g. coping and social support), and biological factors.

2.2 Review of the literature

The literature reviewed in this chapter was gathered systematically using specific search terms between October 2012 and December 2015 on the APA PsycNET database (which encompasses the PsycINFO, PsycEXTRA, and PsycARTICLES databases). The search terms used were: child, cortisol, stress test (for articles relating to stress testing), child, resilience, stress (for articles relating to stress and resilience), and child, coping, stress (to capture advances in the stress and coping literature). These search terms were created in October 2012 and an email alert was set up to capture any new articles using these key words when they were added to one of the databases. Other relevant articles were found using the reference lists of these papers, textbooks, and recommendations from supervisors and colleagues.

2.3 Theories of stress

The theories of stress detailed in this section are discussed in broadly chronological order, from the early theories which emphasised the stressor, to the more modern theories which focus on the transaction between an individual and their environment. Adaptations and variations of the theories are also discussed.

2.3.1 General adaptation syndrome (GAS)

Early theories of stress focused predominantly on the stress environment rather than an individual's response to it. For example, theories such as general adaptation syndrome (GAS; Selye, 1956, 1976) suggest that there are three parts to the stress response system: alarm (when the stressor is detected), adaptation or resistance (mobilising the stress response to maintain allostasis), and exhaustion (the occurrence of stress-related illness) which occurs during chronic or prolonged stress. Other researchers have built on Selye's (1956, 1976) theory by suggesting that it is an individual's response to stress rather than the stress itself that causes illness to occur (Sapolsky, 2004). Rather than the stress response running out, as is suggested by the exhaustion phase of GAS theory, Sapolsky (2004) proposes that it is the continued release of stress hormones which is damaging to health, i.e. the damage is caused by the stress not stopping as opposed to the stress response running out.

2.3.2 The transactional model of stress

In the 1980's theories of stress began to move from a stressor-focussed approach towards a focus on the relationship between a person and their environment (i.e. stress as a process) (Sarafino, 2008). The transactional model of stress and coping (Lazarus & Folkman, 1984) suggests that stress results from an imbalance between a stressor and an individual's perceived ability to cope, therefore when a stressor is encountered an appraisal or evaluation must be made. The researchers distinguished between two types of evaluation: primary and secondary appraisal, however they were careful to note that this does not mean that one process occurs prior to the other or that one is more important than the other. Primary appraisal involves an assessment of the impact of the stressor and secondary appraisal refers to the evaluation of the coping resources available to deal with the stressor (Lazarus & Folkman, 1984).

The transactional stress and coping model has been expanded and applied to a number of different healthy and ill populations. The most relevant to the present research with children include siblings of chronically ill children (Gold, Treadwell, Weissman, & Vichinsky, 2008) and children with sickle cell disorder and diabetes (Hocking & Lochman, 2005). Although the transactional stress and coping theory has been very influential there are some criticisms of it, for instance Kemeny (2009) suggested that, when applied to psychoneuroimmunology (PNI) studies, this model can be problematic because of the

number of potential relationships between psychological variables and immune processes are immense.

2.3.3 Allostatic load

As alluded to in the previous section, later theories of stress began to focus on more biological aspects of stress such as PNI and the stress response system. These more biological theories of stress include allostasis and allostatic load which centre on the impact of repeated stress exposure on the body's stress response. Allostasis refers to maintaining the body's balance, while the term 'allostatic load' was coined by McEwen and Stellar (1993) who defined it as "the cost of chronic exposure to fluctuating or heightened neural or neuroendocrine response resulting from repeated or chronic environmental challenge that an individual reacts to as being particularly stressful" (p. 2093). Therefore repeated acute stressors or chronic stressors can be damaging to the physical stress response system.

2.3.4 Models of social threat

Kemeny (2009) developed a theory of social threat based on an animal behaviour model but expanded to take into account the complexity of human brains in order to create "a human model of social status threat" (p. 1). This model of social threat suggests that individuals who are exposed to chronic social threats (e.g. discrimination or low socioeconomic status; SES) have "a neural sensitivity to acute social threat experiences as well as ambiguous social contexts, such that neurohormonal pathways (HPA, SNS) become more easily activated" (Kemeny, 2009, p. 3). The neurohormonal pathways referred to here are the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic nervous system (SNS).

This theory proposes that people who have experience of chronic stress are more likely to have an elevated stress response when they encounter an acute stressor than people without experience of chronic social threat stress. Support for this theory is provided by research which compared students' responses to a simulated acute stressor, in the form of a carbon dioxide (CO^2) inhalation test, during exam stress and during a time with no exam stress (Loft et al., 2007). CO^2 inhalation tests are used as a method of stress testing because inhalation of CO^2 activates the body's stress response system, therefore higher cortisol suggests more stress experienced during the task. The researchers found

that cortisol was higher during exam stress, suggesting that stress responses were impacted by the presence or absence of chronic or 'background' stress (Loft et al., 2007).

Kemeny's (2009) model is closely linked to another key theory of particular relevance to social stress: social evaluative threat (SET). This theory suggests that social stressors can have a physiological as well as a psychological impact (Dickerson, Gruenewald, & Kemeny, 2009; Dickerson & Kemeny, 2004; Gunnar, Talge, & Herrera, 2009). Several studies have suggested explanations for why psychological stressors can cause physiological changes, such as activating the HPA axis and increasing the release of stress hormones such as cortisol. For instance, Kemeny (2009) states that "acute social threats are reliable and powerful elicitors of HPA activation" (p. 5) and Dickerson et al. (2009) concurred that rises in cortisol can be produced by psychological stressors such as threats to the social self or to self-esteem, as well as changes in acceptance or social status. Both of these researchers emphasise the significance of social threat in producing a stress response and the importance of "maintaining a positive social self" i.e. the self that you present to the world (Dickerson et al., 2009, p. 271).

Critics of SET have suggested that social stress tests may actually work (i.e. elicit a stress response) based on mere social presence rather than because of feelings of threat to an individual's social self. To be exact, they suggested that simply having people present during a task (as an audience) is enough to induce a stress response and that it is not required that the participant feels negatively judged by the audience. However research by Dickerson, Mycek, and Zaldivar (2008) demonstrated that when 89 students delivered a speech in one of three conditions (alone, in the presence of an uninterested person, or in a SET condition) there was only a significant cortisol increase in the SET condition, not when merely in the presence of another person. These results were supported by Gruenewald, Kemeny, Aziz, and Fahey (2004) who found that 41 participants who performed a stress test in a social evaluation condition showed increases in cortisol compared to 40 participants who completed a stress test in the condition with no social evaluation. Therefore, SET remains an essential aspect of laboratory based social stress tests.

2.3.5 Characteristics of stress

The discussion above of social threat, and in particular SET, has highlighted one of the key characteristics of stress, however there are three other underlying characteristics. These characteristics are controllability, predictability and timing. These features of stress

can be examined and manipulated during social stress testing (a methodology integral to the current programme of research which will be discussed in detail in the next chapter). It is important to outline the key features of stress in this section on theory, as some of the key theories of stress include reference to stress characteristics. For example, Haan's (1977, 1993) theory of ego defences in coping with stress, suggested that successful coping or adaptation to stress was more difficult when the stressor was uncontrollable, when it was a form of toxic stress, and when an individual has no past experience with that type of stressor.

As mentioned above, these characteristics of stress have been manipulated and examined in laboratory stress testing. Uncontrollability was found to be integral in eliciting a stress response during social stress testing (Rudolph, 2008) and a meta-analysis of stress reduction interventions with children and adolescents found that increasing perceived control positively impacted stress and coping (Kraag, Zeegers, Kok, Hosman, & Abu-Saad, 2006). The timing and duration of stressors were also shown to have an impact on stress responses (Lupien, McEwen, Gunnar, & Heim, 2009; Miller, Chen, & Zhou, 2007).

These features have also been examined in naturalistic stressors. A meta-analysis of the impact of natural stressors on cortisol in adults found that the features of a stressor which have the most impact are previous experience of stress, and chronicity and controllability of the current stressor (Michaud, Matheson, Kelly, & Anisman, 2008). Similarly, uncontrollability of a chronic stressor has been found to lead to higher cortisol in adults (Miller et al., 2007).

It is evident from the discussion above that these features are integral to our understanding of what makes a situation stressful. However, not all individuals find the same situations stressful; there is an element of perception involved. This is known in the literature as perceived stress, and can determine why one person has a stress response to a particular situation but another does not. Similarly, stressful situations can vary in importance; they can be large or small, major or minor. Therefore, it is important to consider these features of stress as well as the characteristics outlined above. As stressful situations can encompass a wide range of situations they are often categorised into groups in the literature, such as major life events and (more minor) daily stressors. Major life events include situations such as death of a family member (Holmes & Rahe, 1967) and daily hassles include falling out with a friend (Kanner, Coyne, Schaefer, & Lazarus, 1981; Kanner, Feldman, Weinberger, & Ford, 1987).

2.4 Theories of coping

Twentieth century theories and models of coping arose from psychodynamic approaches, cognitive theories, and animal models, although the latter did not have as much influence as they were found to be deficient in explaining human coping (Radnitz & Tiersky, 2007). Gottlieb (1997) suggests that there are three broad theoretical models of coping and adaptation to acute stress in the coping literature: the psychodynamic approach (i.e. involuntary defence mechanisms), coping styles (i.e. theories with dichotomies such as approach/avoidance etc.), and coping processes (i.e. transactional models). The third category is the theoretical approach taken by most researchers, for example Lazarus and Folkman's (1984) transactional model. Coping processes theories suggest that coping is flexible and changeable dependent on the situation and timing. This flexible approach very much underlies the current research programme. A range of different typologies to categorise coping responses can be found in the literature, for example problem- and emotion-focussed, approach and avoidant, primary and secondary coping (Boekaerts & Roder, 1999) which will be discussed below.

2.4.1 The transactional model of coping

Cognitive theories of coping, such as Lazarus and Folkman's (1984) model, focus on the cognitive processes that mediate between the stressor and a person's behavioural and emotional responses (Radnitz & Tiersky, 2007). Lazarus and Folkman's (1984) model of stress and coping, the first part of which was discussed in the theories of stress section, also incorporates a second part regarding coping theory. The researchers distinguished between two different types of coping; one which is aimed at the stressor and one which is aimed at the individual. Problem-focussed coping "is directed at managing or altering the problem causing the distress" and emotion-focussed coping "is directed at regulating emotional responses to the problem" (Lazarus & Folkman, 1984). It has commonly been found that when an individual appraises that something can be done about a stressor a problem-focussed approach is taken but when they appraise that nothing can be done an emotion-focussed approach is taken (Lazarus & Folkman, 1984). As discussed in a meta-analysis of coping and adjustment in children with cancer, when problem-focussed and emotion-focussed coping are orientated towards a stressor they are termed approach and avoidant coping (Aldridge & Roesch, 2007).

2.4.2 Control models of coping

Another cognitive theory of coping is the model of perceived control, also known as the primary-secondary control model of coping (Rothbaum, Weisz, & Snyder, 1982; Weisz, McCabe, & Dennig, 1994). This is a two-process model encompassing primary control, which involves attempts to adapt the environment to one's needs, and secondary control, which involves adapting oneself to the environment. Rothbaum et al. (1982) suggest that there are four types of secondary control: predictive, illusory, vicarious, and interpretive. This model has been applied to research with both healthy and chronically ill child populations, for example investigating children's adjustment to juvenile diabetes (Band & Weisz, 1990).

A similar control model of coping was outlined by Compas, Connor-Smith, Saltzman, Thomsen, and Wadsworth (2001) who categorised coping into three groups: primary control/active coping, secondary control/accommodative coping, and disengagement/passive coping. This model found that overall secondary coping led to more successful adaptation, disengagement coping was related to poorer adjustment and there were mixed results for primary control coping. These mixed findings suggest that different stressors and contexts may require different coping strategies in order to lead to a positive adaptation outcome (Compas et al., 2001). This finding has also been echoed by research utilising other conceptualisations of coping, as listed earlier in this section (Aldridge & Roesch, 2007; Boekaerts & Roder, 1999; Compas et al., 2001). For example, problem-focussed coping was found to be more effective for coping with controllable stressors and emotion-focussed coping deemed more appropriate for uncontrollable stressors (Hampel, Rudolph, Stachow, Laß-Lentzsch, & Petermann, 2005). Other researchers have pointed to the importance, not just of the context-dependent nature of coping, but also the temporal nature, for example avoidant coping can be more successful in the short-term and approach coping more successful for long-term positive outcomes (Chronister & Chan, 2007).

2.4.3 The hierarchical model of coping

Krohne (1996) suggests an alternative theory of coping known as the hierarchical coping model which captures some of the elements of the models already discussed. This model incorporates macroanalytic and microanalytic categories; the macro level suggests that coping is a trait which consistently appears in response to stress whereas the micro level "entails more specific types of emotional, behavioural, and cognitive efforts than are

used in anticipation of, response to, and recovery from stress" (Chronister & Chan, 2007, p. 55). Approach and avoidance coping are central to the macroanalytic category and problem- and emotion-focussed coping are key dimensions of the microanalytic category.

It can be observed from the descriptions of the transactional model of stress and coping and the two cognitive models of control, that although these theories use different terminology they are describing very similar concepts. Problem-focussed coping is targeted at the stressor, as is primary control/active coping, and emotion-focussed coping is directed at the individual's response to stress, as is secondary control/accommodative coping. The hierarchical coping model also incorporates many of these aspects of coping into its macro and microanalytic categories. The present programme of research is enmeshed in these conceptualisations of coping, and therefore draws on all of these models of coping, however in order to enhance clarity and consistency across the thesis the terminology used by Lazarus and Folkman (1984) will be incorporated throughout, i.e. problem- and emotion-focussed coping.

2.4.4 Coping theories applied to children and chronically ill populations

The models discussed above have been created and applied within healthy, predominately adult, populations. Boekaerts and Roder (1999) conducted a literature review of stress and coping in children with chronic illness and found that there are no models specifically addressing children's coping, therefore most research investigating children's coping adopts Lazarus and Folkman's (1984) model. The present programme of research also uses this model, however it is worth noting that a number of models have been developed specifically for use in chronically ill populations (including children, although not exclusively). These models include Wallander and Varni's (1989) disability-stress-coping model which has been applied to children with sickle cell disease (Casey, Brown, & Bakeman, 2000), adolescents with chronic illnesses (Meijer, Sinnema, Bijstra, Mellenbergh, & Wolters, 2002) and in research with parents of chronically ill children (Gudmundsdottir, Gudmundsdottir, & Elklit, 2006). Another model, the risk and resistance framework, which is based on the disability-stress-coping model, has been used in research with children with type I diabetes (Amer, 1999). These models are effective in combining aspects of stress and coping models used with healthy populations and the addition of criteria directly relevant to coping with chronic illness.

2.4.5 The temporal and situational nature of coping

As mentioned previously, theories of coping processes view coping as changeable, supporting the interpretation that coping strategies are not static or a trait, but that they can be time and situation dependent. One area of coping research in children has focused on how coping strategies can change throughout development. Aldwin (2009b) discusses the changing coping strategies that are used across the life course, for example: infancy (strategies: crying, thumb sucking), toddlers (self-control, problem-solving), pre-schoolers (denial, parents as social support), middle childhood (cognitive distraction, criticism of oneself and others), and adolescence (humour, social withdrawal). Two coping strategies have been listed for each age group from infancy to adolescence although there are a wider range of strategies used at each stage, and different strategies used during adulthood.

Use of secondary control coping increases with age, a strategy which is generally linked to better outcomes, however situational factors such as the controllability of the stressor impact which coping strategies lead to the best outcomes (Band & Weisz, 1990; Weisz et al., 1994). For example emotion focussed coping is linked to better outcomes when the stressor is uncontrollable and problem focussed is more successful for controllable stressors (Spirito, Stark, Gil, & Tyc, 1995). There are some discrepancies and disagreements within the coping literature, specifically the rumination-distraction and engagement-disengagement literature as to which coping strategies are most beneficial. The rumination-distraction literature can appear to challenge the engagement-disengagement literature as engagement is generally associated with more positive outcomes and disengagement with negative outcomes. Yet rumination is a form of engagement which can lead to negative mood while distraction is a form of disengagement which leads to improved mood (Gottlieb, 1997). This suggests that when using this conceptualisation of coping, perhaps more refined distinctions are needed with more weight given to the distinction between effortful and involuntary coping (Compas, Connor, Osowiecki, & Welch, 1997; Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000). Effortful coping includes any response which is a purposeful reaction to stress, whereas involuntary coping comprises instinctual or automatic responses (Compas, 1987).

2.5 Theories of resilience

Early work on resilience focussed on identifying factors which were likely to enhance resilience; this pioneering work was carried out by researchers such as Werner, Garmezy and Rutter (Prince-Embury & Saklofske, 2013). This early research into

resilience factors is now known as the first wave of resilience research (Masten, 2007). The second wave of resilience research applied some of these protective factors to at-risk populations, the third wave began to concentrate on the development of resilience enhancing interventions, and the fourth (and current) wave of research intends to better understand resilience by utilising multiple levels of analysis (Masten & Obradovic, 2006; Masten, 2007; O'Dougherty Wright, Masten, & Narayan, 2013).

2.5.1 Multilevel models of resilience

Most of the models and theories of resilience are in line with the multilevel analysis approach taken in the fourth wave of resilience research, e.g. Cicchetti (2010). Multilevel approaches focus not only on behavioural and psychosocial factors, as research did up until the past decade, but also on factors more recently accessible through new technology and scientific advancement, such as neurobiological and genetic factors (Cicchetti, 2010). Multilevel models of resilience such as the preconception stress and resiliency pathways (PSRP) model emphasise the role of parental factors, in particular maternal allostatic load and SES factors, in the development of resilience (Ramey et al., 2015).

Similarly, multilevel approaches are part of Masten's (2014) resilience framework for action which incorporates four aspects: framing positive goals (mission); including and assessing strengths, positive outcomes and adaptive processes (models and measures); reducing risk and improving access to resources (methods); and using multiple levels and approaches (multilevel). According to a report conducted by the charity Barnardo's these multilevel models of resilience can be applied in practice using one of three approaches: risk-focussed (a prevention approach eliminating exposure to adversity), asset-focussed (providing or improving access to protective resources), and process-focussed approaches (attempts to change how systems work in order to improve outcomes). Interventions which combine these three approaches have been found to be the most successful (Newman and Barnardo's., 2004).

2.5.2 The resilience scale

An alternative model of resilience, informed by a developmental perspective, is the resilience scale outlined by Kendall-Taylor (2012). This simplifying model suggests that we can think of children's lives as a set of balancing scales on which positive factors can be stacked on one side and negative factors on the other side. A resilient child's scale would tip to the positive side and vulnerable child's would tip towards the negative side.

However, each child's central balancing point or pivot is not necessarily in the centre, for example a child who is born into a family with low SES and genetic factors predisposing them to stress vulnerability would have a balancing point further away from the centre. Therefore, their scale would more easily tip to the negative side. This early position of the pivot is important but can also change over time with the addition of more positive factors. The more positive or resilience factors an individual has the more likely their scale will tip to the positive side, thus making them better adjusted and able to cope with stress (Kendall-Taylor, 2012). This conceptualisation of children's resilience underlines the importance of their family circumstances, genetic disposition, the life stress they encounter, and the resources they develop. Many of these aspects will be addressed in the current programme of research. The present research also encapsulates Masten's (2014) multilevel approach used during the fourth and current wave of resilience research as it incorporates multiple quantitative and qualitative methods to examine children's stress responses, coping and resilience.

2.6 The physiology of stress

Stress can have a powerful psychological and physiological impact. This section will focus on the physiological impact that stress has on the body's dual stress response system: the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic adrenomedullary (SAM) pathway. When a situation is evaluated as stressful the brain, specifically the hypothalamus, sends signals to the pituitary gland and the adrenal medulla; the former deals with long-term stress via the HPA axis and the latter with short-term stress responses through the SAM pathway. The SAM response is immediate (ending in the production of adrenaline) whereas the HPA response (and the production of cortisol) occurs 20 minutes after the onset of the stressor.

When the HPA axis is activated by a stressor this causes the hypothalamus to release corticotrophin-releasing hormone (CRH) which, along with other hormones, stimulates the release of adrenocorticotropic hormone (ACTH) from the pituitary (Nicolson, 2008). ACTH then travels through the bloodstream and reaches the adrenal cortex where it triggers the release of cortisol, therefore cortisol levels are used as a gauge of HPA axis functioning (Dieleman, van der Ende, Verhulst, & Huizink, 2010). In a systematic review of 40 studies, cortisol was found to be the most widely used biomarker for measuring psychosocial stress, especially when using a time-series approach to measure stress at multiple time points (An et al., 2015). Cortisol can be measured using a

variety of body fluids, the most prevalent include blood, saliva, urine and hair. The method of collection determines the type of assessment and issues for consideration, for example total output, whether the sample is retrospective (in hair sampling), and the diurnal decline and cortisol awakening response (CAR) (in saliva sampling). For these reasons, if saliva is being repeatedly sampled, it is taken in the late afternoon (when the diurnal curve is flattest) due to the circadian rhythm and diurnal pattern of cortisol (Nicolson, 2008). A diurnal pattern refers to something which has a daily cycle and the CAR is the sharp increase in cortisol that occurs during the first thirty minutes after awakening. Often the peak point of the CAR is 50-160% higher (in saliva) than normal cortisol levels throughout the day (Nicolson, 2008).

Another core component of the body's stress response is the SAM pathway which is part of the sympathetic branch of the autonomic nervous system (ANS). The ANS regulates homeostasis, so while the sympathetic branch is activated by stress leading to the 'fight or flight' response the parasympathetic branch is deactivated until the stressful situation is over when it controls the 'rest and digest' system (Sapolsky, 2004). The SAM system is activated when the hypothalamus sends signals to the adrenal medulla which produces the hormone adrenaline beginning the fight or flight response detailed above. When the fight or flight response is activated this increases heart rate, therefore heart rate (HR) and heart rate variability (HRV) are often used as measures of ANS and SAM activity (Michels et al., 2013).

Although activation of the physiological stress response systems can be adaptive and does not cause any harm, if the HPA axis is repeatedly activated "the stress response can become more damaging than the stressor itself, especially when the stressor is purely psychological" (Sapolsky, 2004, p. 13). This repeated 'wear and tear' of the stress response systems is part of the theory of allostasis and allostatic load (as discussed in the theories of stress section). This wear and tear can cause physiological responses to become maladaptive, causing exaggerated reactivity to stress, slower recovery post-stressor, and activation when there is no threat (Dickerson et al., 2009). Chronic exposure to stress hormones, such as cortisol, can also impact the structures in the brain related to cognition and mental health (Lupien et al., 2009).

2.7 The impact of psychosocial processes on health, stress and resilience

There is a wealth of research focussing on the wide range of psychosocial processes that can influence health outcomes, stress reactivity, and resilience. Psychosocial factors

can positively influence individuals in terms of enhancing their ability to cope with stress and maintain wellness (these factors are known as assets or protective and promotive factors). They can also negatively influence individuals leading to maladaptive stress responses and illness (these factors are known as risk or vulnerability factors) (Luthar, Sawyer, & Brown, 2006).

The relationship between psychosocial processes and stress, health and resilience are dynamic and bidirectional (see Figure 2.1). These relationships are well documented in biopsychosocial models such as the model proposed by Lutgendorf and Costanzo (2003) which integrates health psychology and PNI to provide a holistic understanding of health. The researchers suggest that psychosocial processes (e.g. individual differences, resources), biological factors (e.g. sex, age), health behaviours (e.g. sleep, diet, exercise), and life stress all impact neuroendocrine and immune mechanisms, which in turn influence vulnerability or resistance to disease (Lutgendorf & Costanzo, 2003). For example, psychosocial factors can alter the body's stress response system, which can impact the likelihood of developing an illness (Turner-Cobb & Steptoe, 1998). Equally, the experience of illness can affect psychosocial processes, such an individual's ability to cope with stress, which then influences resilience (D'Imperio, Dubrow, & Ippolita, 2000; Hampel et al., 2005).

Figure 2.1 includes several of the elements of the Lutgendorf and Costanzo (2003) biopsychosocial model, including life stress, psychosocial processes, and stress reactivity. However, as the main focus of the biopsychosocial model is how these factors impact health, it does not incorporate resilience. The next section of this chapter will also focus on how psychosocial processes impact health, and the two subsequent sections will build on this model by investigating these processes in relation to their impact on stress reactivity and the development of resilience in children.

In the present literature review the subheadings correspond to the factors outlined in Lutgendorf and Costanzo's (2003) model. Life stress includes both acute and chronic stressors, with an emphasis on the impact of early life experiences of stress. Psychosocial processes include individual differences (e.g. personality factors), resources (e.g. coping, social support, cognitive skills). Biological factors include age and sex.

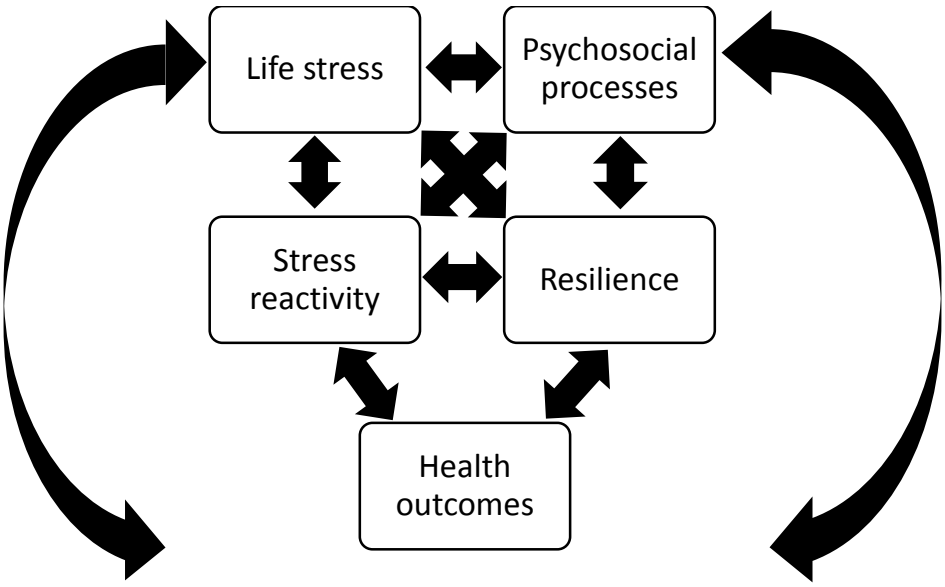


Figure 2.1. Diagram outlining the bidirectional relationships between psychosocial processes, life stress, stress reactivity, resilience and health outcomes

2.7.1 Psychosocial processes that impact health

Stress can have multiple effects on health such as "increasing the likelihood of a weakened immune system, heart disease, obesity and diabetes" (Terzian et al., 2010, p. 1). As seen in Figure 2.1 health can be affected directly by psychosocial processes but also indirectly when psychosocial factors impact stress responses or resilience which in turn have an effect on health. For example, the high levels of cortisol induced in response to a social stress test are associated with more health problems (Knack, Jensen-Campbell, & Baum, 2011) and low resilience is linked to an increased stroke risk in young boys (Bergh et al., 2014). Most of the research in this area has focused on the impact of life stress (such as early life stress and adversity: ELS/ELA) and psychosocial resources (such as social support) on health.

2.7.1.1 Life stress

Life stress, such as ELS/ELA, has been found to increase the likelihood of health inequalities later in life (Evans, Exner-Cortens, Kim, & Bartholomew, 2013) particularly adversity related to SES factors such as income (Braveman & Barclay, 2009). As discussed above psychosocial factors can impact health through a number of routes, but the way that ELA contributes to disease is primarily through the HPA axis and allostatic process (Essex et al., 2011) and the "biological embedding of adversities" (Shonkoff, Boyce, & McEwen,

2009, p. 2252). However ELA can also impact stress reactivity (an issue which will be discussed further on in this chapter) and emotional regulation (i.e. coping), which in turn affects risk taking and impulsive behaviour, leading to poorer health outcomes (Lovallo, 2013). Interactions between environmental factors (such as exposure to stress) and genetic predispositions (Ehlert, 2013) can explain why there are individual differences in stress responses and development of illnesses, such as asthma, diabetes and cancer (McEwen & Stellar, 1993).

The cumulative impact of childhood stressors is another important route through which developmental and biological disruptions in childhood (such as ELA) impact adult health (Nurius, Prince, & Rocha, 2015; Shonkoff et al., 2009). This cumulative effect arises because risk factors tend to appear in groups and increase over time (Masten, 2014; Segerstrom & O'Connor, 2012). If the adversity experienced is excessive, persistent or uncontrollable and there is no buffer to the stress, such as social support, then there can be negative effects on disease over the life course (Shonkoff et al., 2009). The effects of ELA can be reduced or exacerbated in adulthood through the development of resilience or increased experiences of stress respectively (Nurius, Green, Logan-Greene, & Borja, 2015).

The research described above has focussed on the impact of ELA on physical health, however there is also a wealth of research addressing the mental health implications of childhood stress and adversity. Experiences of ELA, ranging from maltreatment and poverty to negative parenting styles (such as disinterested or punishing approaches) have been linked to the development of depression in adolescence (St Clair et al., 2014). Adolescents who have experienced high levels of stress were four times more likely to develop anxiety and depression than those who have experienced low levels of stress (D'Imperio et al., 2000).

2.7.1.2 Psychosocial processes: Resources

Psychosocial resources, such as social support, are important protective factors in preventing negative health outcomes in later life. These resources can have both a direct and indirect effect on health. For example, Sapolsky (2004) suggests a four stage PNI route through which social support and social isolation can indirectly impact health. This begins with how people who are socially isolated are more stressed due to their lack of social support, leading to chronic or repeated activation of the stress response system, which can cause immune suppression, and therefore increase the likelihood of infectious diseases.

Research has suggested that social belongingness may underlie the buffering effects of social support, as higher levels of social belonging and self-esteem were linked to fewer illness symptoms and improved mood in adolescents (Began & Turner-Cobb, 2012). Therefore attachment to parents and peers can act as a buffer between stress and illness (Greenberg, Siegel, & Leitch, 1983). Social support and coping can also act as moderators in the relationship between life stress and vulnerability to illnesses (such as upper respiratory infections; URI) in children, predominantly in relation to the occurrence and duration of such illnesses (Turner-Cobb & Steptoe, 1998).

Social support has also been found to impact upon the progression of disease. For example a supportive social network and good family interactions can positively influence the progression of disease in children with atopic illnesses (Gustafsson, Kjellman, & Bjorksten, 2002). Similarly, children with asthma who described high levels of chronic family stress showed an increase in the production of asthma related cytokines (Marin, Chen, Munch, & Miller, 2009). This research suggests that negative social interactions can be detrimental to the immune system and, correspondingly, that positive social support can improve disease outcomes.

Cognitive factors such as conscientiousness have also been found to impact health (Gartland, O'Connor, & Lawton, 2012). This research suggested that conscientiousness was related to the appraisal of daily life stress, with stress potentially moderating the relationship between conscientiousness and health. For example, increased conscientiousness can lead to more confidence in coping with daily stressors and increased positive affect (Gartland et al., 2012; Gartland, O'Connor, Lawton, & Ferguson, 2014).

2.7.2 Psychosocial processes that impact stress reactivity

This section will focus on the positive and negative effects that life stress (particularly early life adversity), individual differences, psychosocial resources (such as coping and social support) and biological factors have been found to have on individual's stress reactivity. The majority of the research discussed in this section was conducted with children and adolescents, however adult research has been included when relevant.

2.7.2.1 Life stress

Life stress, particularly ELA, can have a profound impact on stress reactivity. Most examples of ELA in the research include severe chronic stress experiences such as poverty and low SES (Sripada, Swain, Evans, Welsh, & Liberzon, 2014), maltreatment (MacMillan

et al., 2009; Trickett, Gordis, Peckins, & Susman, 2014), institutional care and adoption (Burkholder, Koss, Hostinar, Johnson, & Gunnar, 2015; Gunnar, Frenn, et al., 2009; Hostinar, Johnson, & Gunnar, 2015a), and parental mental health issues (Belsky, Ruttle, Boyce, Armstrong, & Essex, 2015; Essex et al., 2011; Hayden et al., 2014; Mackrell et al., 2014). However a small number of researchers have focused on less severe, but still impactful, experiences such as bullying and prenatal stress (Knack et al., 2011; Quesada, Tristao, Pratesi, & Wolf, 2014).

In a systematic review of stress testing in children from birth to five years old with experience of ELA (which included any environmental factors that had impacted the child during pregnancy, birth and afterwards) it was found that in 27 out of 30 studies ELA had an effect on children's cortisol responses to stress (Hunter et al., 2011). Thirteen of the studies found that adversity increased cortisol reactivity and three studies found that it decreased reactivity. Similarly mixed findings were found in relation to cortisol baselines: three studies reported higher baselines in children with experience of ELA and three studies reported decreased baseline levels (Hunter et al., 2011).

Even across studies that have found an increase in cortisol reactivity in response to social stressors, there are differences between studies in regard to cortisol levels during baseline and recovery from social stress. These differences included the finding that children who have experienced poverty have higher cortisol in anticipation of a social stressor (Sripada et al., 2014), whereas another study reported lower baseline cortisol in young adults whose mothers had experienced prenatal stress (Entringer, Kumsta, Hellhammer, Wadhwa, & Wust, 2009). Lower cortisol was reported in the recovery period in adolescents who reported more peer victimisation (Knack et al., 2011).

As mentioned above in regard to the systematic review findings, some research has reported a consistently blunted stress response in children with experience of ELA. For example, blunted responses were found in young adults with a family history of alcoholism (Lovallo, 2013), maltreated adolescents (Trickett et al., 2014), and children who remained in institutional care compared to normally developing children and children who moved into foster care (McLaughlin et al., 2015). Blunted responses to stress were found not only in cortisol but also in heart rate (HR) responses to social stress in maltreated adolescent girls (although cortisol and HR levels during the recovery period were found to be comparable to a control group) (MacMillan et al., 2009). Yet when assessing cortisol and HR in young adults who had experienced major life events in their early life, cortisol but not HR was found to be blunted, and emotional dysregulation (i.e. emotional non-

acceptance) was found to act as a mediator between ELA and cortisol (Carnuta, Crisan, Vulturar, Opre, & Miu, 2015). Similarly, slower recovery in blood pressure (BP) after a mental arithmetic task was found in children who had experienced poverty (Evans et al., 2013).

A number of explanations have been provided to elucidate why some studies find a blunted or attenuated response to acute stress and some find a heightened stress reaction (these responses are also referred to as stress hypo- and hyper-reactivity respectively). One explanation suggests that the type of ELA can determine whether hypo- or hyper-arousal of cortisol occurs (Essex et al., 2011). Others suggest that puberty exerts an influence over cortisol reactivity. For example, in response to an acute stressor children not at risk of depression displayed the expected cortisol response, whereas children at risk of depression displayed hypo-reactivity or hyper-reactivity depending on their level of pubertal development (Hankin, Badanes, Abela, & Watamura, 2010). The impact of puberty on increased stress reactivity in early adolescence could be due to the neurobehavioural changes that occur during puberty (Dahl & Gunnar, 2009) and the increase in sensitivity to social evaluation which interacts with these pubertal changes (van den Bos, de Rooij, Miers, Bokhorst, & Westenberg, 2014).

Most of the research has concluded that ELA has a negative impact on the HPA axis, most frequently demonstrated by children's altered cortisol responses when faced with an acute stressor (Hunter et al., 2011; Vedhara et al., 2012). Alternatively, some theorists have begun to suggest that a small amount of stress can be good for you, particularly early in childhood, as a moderate level of cortisol can have beneficial effects on neuropsychological development (Forns et al., 2014; Masten, 2014). Heightened childhood HPA axis activation has been linked to blunted adult HPA activity (Essex et al., 2011) yet a blunted stress response plus limbic deactivation can be seen as "markers for biological resilience after ELS" (Grimm et al., 2014, p. 1828).

2.7.2.2 Psychosocial processes: Individual differences

Various personality and temperament features have been linked to both adults and children's stress responses. In research with adults, individuals with low self-esteem show higher cortisol reactivity and those with higher anxiety and distress show higher baseline cortisol (Rabin, 1999). Whereas, characteristics such as novelty seeking are linked to lower cortisol levels in adult stress testing (Tyrka et al., 2007). Corresponding conclusions have been found in child stress research. For example, naturalistic stress research has shown that

children who were more solitary continued to have elevated cortisol after school transitions than the more sociable children (Gunnar, Tout, DeHaan, Pierce, & Stansbury, 1997). This suggests that solitary children were less able to cope with, and adapt to, this stressor.

Another protective personality factor linked to lower cortisol reactivity in children was positive emotionality (Mackrell et al., 2014). Similarly, individual differences such as extraversion and effortful control were also predictive of lower cortisol levels across school transition in four year olds (Turner-Cobb, Rixon, & Jessop, 2008). In adolescents, effortful control was found to be associated with higher heart rate responses and lower subjective distress in response to a social stress test, suggesting that control can be a useful protective factor for older children as well (Oldehinkel, Hartman, Nederhof, Riese, & Ormel, 2011).

2.7.2.3 Psychosocial processes: Resources

Psychosocial resources include social support, coping strategies, and cognitive skills. Social support can have both a direct and an indirect effect on stress reactivity. There are two main routes through which social support can act as a psychosocial modifier of stress, the first of which is stress buffering (i.e. when social support is protective against high stress) and the second is the direct effects hypothesis (i.e. when the benefits of social support apply to both high and low stress situations) (Sarafino, 2008). An example of stress buffering from the literature comes from Hostinar et al. (2015a) who compared the stress responses of adopted and non-adopted children (with adoption given as an example of ELA). The researchers found that social support from a parent reduced cortisol responses in non-adopted children compared to support from a stranger, however cortisol responses were the same for adopted children in both the parent and stranger support conditions (Hostinar et al., 2015a).

The same group of researchers conducted a second study investigating the effect of parental social support, this time comparing children aged 9-10 and adolescents aged 15-16 (Hostinar, Johnson, & Gunnar, 2015b). Parental support was found to be less effective in buffering cortisol stress reactivity for adolescents compared to children during a social stress test (Gunnar & Hostinar, 2015; Hostinar et al., 2015b). Correspondingly, research by Doom, Hostinar, VanZomeren-Dohm, and Gunnar (2015) showed that as pubertal stage increased parents became less effective as a social stress buffer. Other research has also differentiated between groups for whom social support is a useful method for coping with stress and those for whom it is not. Research in adults has shown that partner and stranger

support were stress buffering for men however women exhibited higher cortisol when supported by their partner (Kirschbaum, Klauer, Filipp, & Hellhammer, 1995). Social support from a stranger has also been considered in research with children, in comparison to support provided by a real dog or a toy dog. It was found that in a group of insecurely attached children (seven to 12 year old boys) who completed a social stress test, cortisol was lowest in the real dog condition and even lower if the children stroked the dog. These results signify how physical contact and animal companionship is important for stress reduction in this population (Beetz et al., 2011).

Social support, particularly from parents, can be a useful coping strategy for some groups of children, for instance, younger children and those without experience of ELA. The helpfulness of social support could depend on the level of parent-child attunement and quality of the relationship. For example, mother and child cortisol levels were measured during a stressful task (the child walking on an elevated beam) and the more sensitive and attuned group of mothers were found to have similar levels of cortisol to their children. Whereas the mothers in the less attuned group showed different cortisol patterns from their children, emphasising the importance of physiological attunement between parents and their children (Sethre-Hofstad, Stansbury, & Rice, 2002). Parent-child relationship quality can also act as a moderator of the link between marital conflict and adolescent responses to stress, suggesting a 'dual hazard' if children experience both parental marital conflict and a negative relationship with their parents (Lucas-Thompson & Granger, 2014). Therefore, social support can have a beneficial or detrimental effect on children's stress responses, depending on the quality of the relationship and parent-child attunement.

Other psychosocial resources include coping strategies. Coping is often referred to as a mediator or moderator of stress in the literature (Chronister & Chan, 2007) and therefore many stress-reduction interventions target coping strategies. These interventions target coping with the intention of altering maladaptive stress responses (Tapanes, Distelberg, Williams-Reade, & Montgomery, 2015) and avoiding the potential negative health outcomes associated with stress (Scholten et al., 2011; Terzian et al., 2010). In a meta-analysis of stress management interventions researchers found that targeting coping skills was an effective way of reducing stress (Kraag et al., 2006).

Stress-management interventions also target cognitive factors by harnessing cognitive skills such as fantasy-facilitation (Johnson, Whitt, & Martin, 1987); eye movement desensitisation and reprocessing (EMDR; Beer & Bronner, 2010); social problem solving, social adjustment and emotional self-control (Kraag et al., 2006); and

mindfulness training (Costello & Lawler, 2014; Zenner, Herrnleben-Kurz, & Walach, 2014). A recent review of mindfulness training in schools found it to be a beneficial technique for children as it increased cognitive performance and resilience to stress (Zenner et al., 2014). Increasing cognitive performance can be particularly beneficial as research has found that cognitive vulnerability can predict children's cortisol reactivity (Hayden et al., 2014).

2.7.2.4 Biological factors

Biological factors can influence children's stress responses, predominantly factors such as age, sex and pubertal development. Findings have been varied in relation to sex, however findings regarding age and stage of puberty were consistent; children under 13 years of age showed blunted cortisol reactivity whereas those over 13 showed significant cortisol responses to stress (except for nine year olds who showed heightened cortisol) (Gunnar, Wewerka, Frenn, Long, & Griggs, 2009; Sumter, Bokhorst, Miers, Van Pelt, & Westenberg, 2010). In baseline samples there were higher levels of cortisol as age and pubertal stage increased.

2.7.3 Psychosocial processes involved in the development of resilience

Resilience and adaptation to stress can be mediated by psychosocial factors (Hocking & Lochman, 2005). In keeping with the previous sections on health and stress reactivity, this section will discuss key factors such as life stress and psychosocial processes (e.g. individual differences and resources).

2.7.3.1 Life stress

It has been suggested that experiences of early life adversity can lead to either stress resilience or vulnerability depending on whether the adversity is major or minor; major adversity can lead to vulnerability and minor stress experience can lead to resilience (Shonkoff et al., 2009). This complements the viewpoint that adjustment occurs along a continuum from resilience to maladjustment (Ehlert, 2013). This discussion will first focus on the negative effects that ELA can have on resilience before focussing on some of the positive resilience outcomes.

Masten (2014) suggests that there are three categories of risk factor: genetic risk, stressful life events, and negative circumstances (such as low SES and premature birth). There is little that can be done to alter a person's current genetic susceptibility to risk,

therefore the majority of research has focused on stressful life experiences and other negative environmental circumstances. Environmental risks and adversities that can impact resilience include poverty, homelessness, violence, lack of access to healthcare, along with low birth weight and other perinatal complications (Newman & Barnardo's., 2004; Werner & Smith, 1992). A review of the consequences of childhood trauma and adverse living conditions concluded that ELA can negatively impact psychological adjustment (Ehlert, 2013). Correspondingly, experiences of ELA such as poverty have been found to negatively impact adaptation (Egeland et al., 1993). Individual differences in adjustment were found to be due to psychological and utilitarian family resources, e.g. poor psychological family resources and low SES, which can lead to vulnerability (Wallander, Varni, Babani, Banis, & Thompson Wilcox, 1989).

However, there is a growing body of literature which suggests that experiences of ELA can have a positive impact on physical and mental health. This suggestion that ELS/ELA can lead to resilience, also known as the stress-inoculation hypothesis, has been found in animal studies and, more recently, human studies. For instance, comparing children with no experience of ELA, and those with moderate or severe experience of ELA (Gunnar, Frenn, et al., 2009). These researchers concluded that experience of moderate ELA can lead to resilience when moderated or mediated by psychosocial factors such as coping strategies which make the ELA manageable rather than overwhelming. Shapero et al. (2015) also concluded that moderate ELA could enhance resilience in terms of having a positive impact or 'steeling effect' on both physical and mental health, such as reducing the likelihood of developing depression.

Experiences of coping with stressors such as childhood chronic illnesses can improve coping, contrary to previous research which suggested that illness could have a negative effect on coping (Hampel et al., 2005). Coping with everyday stress can also positively impact resilience and future coping skills as "behavioural and physiologic resilience develops in part from infants' and young children's experience coping with the inherent normal stress of daily life and social interaction" (Tronick, 2006, p. 83). Resilience and positive outcomes can also be aided through emotionally responsive caregiving which can mediate the impact of ELA, such as poverty, family stress and maltreatment (Egeland et al., 1993). Other assets related to ELA that can help the development of resilience include economic advantage, good schools and community resources (Newman & Barnardo's., 2004).

2.7.3.2 Psychosocial processes: Individual differences

A number of personality and temperament factors have been found to have positive and negative effects on the development of resilience. Researchers have suggested that there are five different ways or mechanisms through which these personality factors impact resilience and vulnerability (Wachs, 2006). These mechanisms include: i) children with different temperaments being treated differently by teachers and parents, ii) different children searching for environments which can be detrimental or promotive of resilience, iii) temperament fitting well or badly with environmental demands, iv) temperament affecting the way children respond to stress, and v) temperament affecting the coping strategies that children use (Wachs, 2006). These are all important mechanisms to keep in mind when investigating the relationship between personality and resilience.

Some of the research regarding promotive personality traits can be vague in its definitions of factors, for example some studies focus on the impact of 'positive temperament' on resilience but do not explain what aspects of temperament this refers to (Smith & Prior, 1995). Other research is more specific, focussing on personality factors such as being easy-going and agreeable (Masten, 2014; Werner & Smith, 1992), and having high levels of ego-resilience which has been linked to better emotional and physiological adjustment during exam stress (Spangler, 1997). Having high self-esteem is also promotive of positive emotional outcomes in children and adolescents (Moksnes, Moljord, Espnes, & Byrne, 2010).

Some personality and temperament factors have been highlighted as having potentially deleterious effects for resilience. In adults undergoing a social stress test, individuals who were rated highly on negative emotionality showed more distress in response to the task, and those with higher positive emotionality demonstrated lower cortisol and blood pressure in response to the task (Childs, White, & de Wit, 2014). This suggests that different levels of emotionality have different effects on stress resilience; a finding which was corroborated by Masten (2014) who found that negative emotionality such as neuroticism was linked to stress vulnerability in children. Other factors of temperament such as repressive personality styles have been found to have negative effects on resilience; one study examined aspects of repressive personality style such as defensiveness and found that defensive children were described as more distressed by their parents and had higher levels of depression, both of which impacted their levels of resilience (Drotar, Agle, Eckl, & Thompson, 1996).

2.7.3.3 Psychosocial processes: Resources

Psychosocial resources include social support, coping strategies, and cognitive skills. Social support is a key feature of resilience research, both in terms of predicting which individuals are likely to be resilient or vulnerable to stress, and in relation to interventions which focus on enhancing social support. The routes through which social support is able to impact resilience has been discussed in an earlier section, in terms of stress buffering and the direct effects hypothesis. Social support can have effects on the brain which then lead to resilience through one of these routes (Lupien et al., 2009).

In a study of coping strategies it was the coping processes linked to social support which were most effective at predicting positive social adjustment and resilience, for example the coping styles 'seeking social support' and 'confrontation' were good predictors of positive social adjustment (Meijer et al., 2002). Therefore teaching social skills that enable and encourage seeking social support could be beneficial for resilience (Meijer et al., 2002; Terzian et al., 2010). Research by Wallander and Varni (1989) has highlighted the importance of social support from both family and peers; the researchers found that chronically ill children with support from both sources showed better adjustment than those with support from only one source. They also found that low levels of support could lead to more externalising and internalising behaviour problems.

A large number of studies have focussed on social support provided exclusively by parents, for example the importance of a child having a warm and nurturing relationship with a caregiver (DiCorcia, Sravish, & Tronick, 2013; Masten, Best, & Garmezy, 1990; Masten, 2014). As parents act as role models, their children often base their responses to stress and use of coping strategies on their parents (Werner & Smith, 1992). Therefore a stable parental relationship and successful parental coping are influential factors in children's development of resilience (Frank, Blount, & Brown, 1997; Ramey et al., 2015). Correspondingly, family social support has been linked to improved adjustment, while family conflict predicted poor adjustment (Gold et al., 2008). A strong attachment bond between a child and their parents is also important for parental social support to have a positive impact (Gunnar & Quevedo, 2007; Masten & Obradovic, 2006).

Parenting style is another important social resource for enhancing resilience. Indeed, sensitive and authoritative parenting was found to be an asset to child and family resilience whereas harsh, insensitive, or impaired parenting was a risk factor for poor adjustment (Masten, 2014; Newman & Barnardo's., 2004). Parents can also nurture resilience in children through their own behaviour by being empathic, communicating

effectively, listening actively, and changing parenting techniques that are unsuccessful. A balance needs to be struck between displaying love in a way that makes children feel appreciated and disciplining children in a way that develops self-discipline and self-worth. Parents can also focus on their children's behaviour in order to encourage resilience, for instance by nurturing children's strengths, and teaching them problem solving and decision making skills. Helping them to learn from their mistakes and develop responsibility, compassion and a social conscience also contributes to resilience development (Prince-Embury & Saklofske, 2013). Therefore, owing to the importance of good parenting, strengths based family interventions focus on effective parenting are a useful method to increase child and family resilience (Department of Health, 2007).

Social support from peers has also been found to be influential in the enhancement of positive adjustment outcomes and has been emphasised in interventions with both healthy and chronically ill children (Frank et al., 1997; Waaktaar, Christie, Helmen Borge, & Torgersen, 2004). Interacting successfully with people also enabled children with experience of ELA to thrive (Masten et al., 1990). Friendships with peers that were rated highly in term of relationship quality were found to be significantly associated with resilience (Graber, Turner, & Madill, 2015), whereas experience of peer rejection was a risk factor for negative outcomes (Newman & Barnardo's., 2004). Sources external to family and friends were also drawn on for social support, such as good support networks within schools and the wider community (Newman & Barnardo's., 2004; Ramey et al., 2015) with an emphasis placed on children taking part in extra-curricular activities, thereby giving them the opportunity to succeed and develop positive self-esteem (Masten, 2014).

Therefore, interventions which target coping strategies, such as social skills training, can lead to better outcomes and adjustment (Frank et al., 1997). Teaching social problem solving skills involves six steps: identifying the problem, determining goals, generating alternative solutions, examining consequences, choosing the solution and evaluating the outcome (Forman, 1993). The role of family is also an important aspect of the coping literature, as successful family coping has been found to lead to improved adjustment whereas family conflict predicted poor adjustment (Gold et al., 2008). Therefore, ensuring that child and parent coping strategies are complementary can be an important moderator between stress and positive adaptation (Rudolph, 2008). The relationship between child and parent coping is most relevant during infancy which is when children's ability to cope with stress depends much more on social interactions with their parents. When children are very young their parents calm and sooth them, whereas as

children get older they become better at self-regulating their own emotions (Aldwin, 2009b) and depend more on their peers as a stress-buffering coping strategy.

Learning how to cope with stress, and in particular the different coping strategies available for use with different stressors is an important part of developing resilience (Ylven, Bjorck-Akesson, & Granlund, 2006). For example, learning to cope with everyday stressors has been found to be beneficial in developing stress resilience (DiCorcia et al., 2013). The appropriateness of a coping strategy can depend on personal factors (such as temperament) and situational factors such as features of the stressor itself, for example uncontrollability. When a stressor is uncontrollable it can determine whether problem-focussed or emotion-focussed coping is more likely to lead to a better outcome (Aldwin, 2009a). This research highlights the importance of being able to draw on multiple coping strategies, however other research suggests that consistency in the use of coping strategies can be beneficial. Thompson (1994) compared information seeking versus information limiting coping strategies in a group of children awaiting surgery. The findings indicated that using one strategy consistently was associated with lower anxiety and better stress management than inconsistent use of the same strategy (Thompson, 1994). Therefore using one strategy exclusively can be better for dealing with medical stressors rather than combining coping strategies which can be beneficial for healthy populations. Similarly, most studies suggest that information-seeking coping is better than information-repression or avoidance in dealing with medical procedures (Peterson, 1989).

A range of cognitive skills can have a positive impact on resilience, the most frequently cited include learning systems (e.g. problem solving), self-regulation (e.g. emotion regulation, executive function), and mastery motivation system (e.g. self-efficacy) (Masten & Obradovic, 2006). Being good at learning and problem-solving as well as being perceived as competent and efficacious by others were features that enabled children who had experienced adversity to thrive, suggesting that cognitive function can mediate the negative impact of early experiences (Masten et al., 1990; Newman & Barnardo's., 2004). Intellectual function and achievements such as success in school are also preventative aspects of the learning systems (Masten, 2014; Werner & Smith, 1992). In a review of children's coping in medical settings, intellectual skills such as cognitive appraisal and deployment of attention were important mediators of stress and resilience (Rudolph, 2008). Interventions have also focussed on enhancing skills in social and emotional learning as a way to boost resilience, including cognitive-behavioural programs; strengths based

assessments; and leadership, education, achievement and development programmes (Brownlee et al., 2013).

Socio-emotional skills such as self-regulation are another range of cognitive skills that can lead to improved resilience outcomes in children and adolescents (Lavoie, Pereira, & Talwar, 2014; Masten, 2014). Self-efficacy and a sense of personal control are elements of the mastery motivation system which have been discussed extensively in the literature (Aldwin, 2009a; Masten, 2014; Sarafino, 2008). Prince-Embury and Saklofske (2013) define self-efficacy as "the belief that one can perform novel or difficult tasks and attain desired outcomes" (p139). Belief in oneself and a positive attributional style have also been highlighted by other researchers as useful tools in developing resilience (Aldwin, 2009a; Frank et al., 1997).

As discussed above in relation to learning systems, self-efficacy can also mediate the relationship between experiences of stress and resilience. In a study comparing orphaned and non-orphaned young people aged seven to 17 years, self-efficacy was found to predict resilience in orphans, and self-efficacy combined with perceived social support predicted resilience for non-orphans (Yendork & Somhlaba, 2015). The bereaved children had a stronger perception of support from friends and non-bereaved children had a stronger perception of support from their families, suggesting that these groups of children perceived and drew on different sources of social support depending on their experience of ELS. Resilience interventions often aim to increase perceptions of control and self-efficacy as a method for enhancing resilience in children and adolescents (Sarafino, 2008; Waaktaar et al., 2004).

2.8 Summary

This chapter has provided an extensive background to the relevant theories and psychosocial factors which will be examined in the present programme of research. A wide range of psychosocial processes that impact health, stress reactivity and resilience have been discussed in this chapter, including experiences of life stress, individual differences, psychosocial resources (such as coping strategies, social support, and cognitive skills), and biological factors. Some of these factors have a clear positive impact on health, stress and resilience, while other factors have a negative impact, and some factors are found to have mixed effects, depending on the context and individual.

Chapter three: Methodology

3.1 Chapter overview

This chapter will discuss the epistemology of quantitative, qualitative, and mixed methods research, with a focus on mixed methods epistemology and study design. Pragmatism, which focuses more on the research problem than the methods used, is the prevalent mixed methods worldview and the standpoint taken in the present research programme. There will be a discussion of the methods used to collect data about stress and coping, and how these methods were used to complement each other in the research studies reported in this thesis. Integration of mixed methods and details of how quantitative and qualitative data were analysed is also discussed. The history of research with children and the key practical issues and solutions surrounding conducting research with children will be outlined, along with the relevant ethical considerations for this research programme.

3.2 Epistemology

Epistemology is the philosophical study of knowledge; its central questions regard "what can be known and what it means to know something" (Tashakkori & Teddlie, 2010, p. 101). Quantitative, qualitative and mixed methods research each have their own epistemological standpoints regarding knowledge. These key epistemological paradigms or worldviews include positivism and post-positivism (quantitative), naturalism and constructionism (qualitative), and pragmatism and realism (mixed methods) (Creswell, 2009; Guba & Lincoln, 2005; Morgan, 2007). Each method and its relevant epistemological paradigms will be discussed, although the majority of this chapter will focus on issues and debates surrounding mixed methods research and pragmatism as these are the most pertinent to the present programme of research.

3.2.1 Quantitative epistemology

Quantitative research collects numerical data using methods such as questionnaires and experimental tasks which measure something quantifiable, therefore quantitative research is a suitable method when comparing groups or trying to establish the relationship between several variables (Creswell & Plano Clark, 2011). Most quantitative research comes from a positivist standpoint which views social facts as independent of participants and researchers (Silverman, 2013). However some researchers see positivism as outdated and suggest that new paradigms are needed, particularly when mixing qualitative and

quantitative research methods, as positivism does not fit well within qualitative research designs (Morgan, 2007; Silverman, 2013).

3.2.2 Qualitative epistemology

Qualitative research collects textual data usually through methods such as interviews and focus groups, and suits research in which "the researcher aims to explore a problem, honour the voices of participants, map the complexity of the situation, and convey multiple perspectives of participants" (Creswell & Plano Clark, 2011, p. 7). There is more of a focus on quality rather than quantifiable data, and qualitative research can be approached from several different epistemological standpoints, such as an experienced or constructed position, also known as naturalism and constructionism (Silverman, 2013). Naturalism is an approach to knowledge which aims to reduce assumptions in order to understand people's views of the world from their perspective (Silverman, 2013). Constructionism argues that there is no one true reality, but that the world is constructed through the meanings we give to it (Braun & Clarke, 2013; Forrester, 2010).

3.2.3 Mixed methods epistemology

Mixed methods research involves the collection and integration of quantitative and qualitative data, and has been referred to as "the third methodological movement" (Creswell & Plano Clark, 2011; Tashakkori & Teddlie, 2010). Quantitative and qualitative data can be integrated at various stages in the research process, for example during data collection, data analysis, or when reporting the results (Creswell, Fetters, & Ivankova, 2004). Mixed methods research is seen by some researchers as a form of multimethodology (or multi-methods) whereas others view the two methodologies as distinct (Tashakkori & Teddlie, 2010). Both mixed methods and multi-methods involve the collection of different types of data, but they differ in regards to whether the methods are dependent or independent from each other. For example, in mixed methods research the quantitative and qualitative methods are part of a core project in which they are dependent upon one another; each method is integral to the other therefore the findings cannot stand alone. Whereas in a multi-methods design, the two methods are self-contained and independent of one another, therefore they can be analysed and understood separately (Tashakkori & Teddlie, 2010).

Most mixed methods research takes a pragmatic approach which focuses more on the research problem than the methods used; methods are chosen based on those which are

best suited to answer the research question (Morgan, 2007). Creswell (2009) lists the main features of pragmatism as a focus on consequences of action, being problem-centred, pluralistic, and oriented around real-world practice. Similar features are noted by Tashakkori and Teddlie (2010) not just of pragmatism but of mixed methods in general, such as methodological eclecticism, paradigm pluralism, diversity, continuous rather than binary data, a cyclical approach, a focus on the research problems when choosing methods, a set of research designs (which will be detailed in the section on design and typology), balance and compromise, and use of visual representations such as figures and diagrams.

A number of debates about the use of mixed methods research exist, the most prominent of which is the argument surrounding the suitability of combining such different methods, followed by the differences in opinion regarding the characteristics of quantitative and qualitative data. These debates will be discussed in the following sections.

3.2.3.1 Arguments for and against mixed methods research

Since mixed methods were first described and defined in 1989, there has been much debate about the appropriateness of mixing methods that come from different epistemological worldviews (Creswell & Plano Clark, 2011). In this epistemological debate some researchers believe that the two methods come from such different paradigmatic approaches that they cannot be compatible (Sale, Lohfeld, & Brazil, 2002; Silverman, 2013). However other researchers think that when the use of mixed methods is guided by pragmatism this worldview allows for quantitative and qualitative methods to coexist in a research study (Guba & Lincoln, 2005; Morgan, 2007). Pragmatism has greatly contributed to the epistemological debate by helping to "clarify some of the issues about what it means to claim knowledge on the basis of mixed methods designs and approaches" (Tashakkori & Teddlie, 2010, p. 102). This approach to mixed methods research acknowledges the epistemological differences between quantitative and qualitative methods but does not see the two techniques as incompatible (Bishop, 2014).

Some researchers agree with the concept of mixed methods research but disagree with pragmatism as an epistemological paradigm; they believe that multiple, even contradictory, worldviews should be used rather than pragmatism, e.g. a constructionist approach for the qualitative aspects of the study and a positivist approach to the quantitative aspects (Greene & Caracelli, 1997). Others believe that if one method follows another (e.g. the quantitative part of the study comes after the qualitative part) the worldview can change, however if the methods are used concurrently they must encompass

the same worldview (Creswell & Plano Clark, 2011). A more extreme viewpoint is that paradigms should be removed from research altogether as the three terms (quantitative, qualitative, and mixed methods) are outdated and unhelpful (Silverman, 2013; Tashakkori & Teddlie, 2010); the removal of paradigms would allow for "a rebirth of research from the ashes of mixed methods" (Symonds & Gorard, 2008, p. 1). However, despite these arguments, the majority of mixed methods researchers support the use of a pragmatic approach to research (Tashakkori & Teddlie, 2010).

There are advantages and disadvantages to mixed methods research; advantages include offsetting the weaknesses of individual methods, providing more evidence for a particular outcome or theory, ability to compare methods, and the inclusion of multiple paradigms (and therefore diverse beliefs and values). Whereas disadvantages comprise mostly of practical issues such as the researcher requiring both qualitative and quantitative skills, the research taking more time and resources, and the need to convince others of the validity of mixed methods research (Creswell & Plano Clark, 2011). The advantages of mixed methods research listed here clearly outweigh the practical challenges of the research, as using mixed methods is an intuitive way of conducting research which is able to provide a fuller and more holistic picture of research topics (Creswell & Plano Clark, 2011).

3.2.3.2 Characteristics of qualitative and quantitative methods

Morgan (2007) suggests that qualitative, quantitative and mixed methods research differ in relation to connecting theory and data, the research process, and inferences that can be made from the data. For example he states that qualitative research is inductive, subjective and provides context; whereas quantitative research is deductive, objective and generalizable, with mixed methods being abductive, intersubjective and making transferable inferences. Although these may seem like distinct differences Morgan (2007) accepts that these differences are not absolute, in that "any experienced researcher knows that the actual process of moving between theory and data never operates in only one direction" (Morgan, 2007, p. 70). Similarly, quantitative research and analysis can be just as subjective as qualitative research (Symonds & Gorard, 2008). Greig and Taylor (1999) also emphasised the differences between methods in terms of being experimental versus non-experimental, objective versus subjective, and coming from a positivist versus constructionist standpoint, however they noted that research is beginning to focus more on

the similarities between these two methodologies and using them to complement one another.

The pragmatic approach to mixed methods uses abductive reasoning so it can move between induction and deduction depending on the stage of the research, for example findings using one method can be converted into a theory which can then be tested using another method. Inter-subjectivity allows for mixed methods research to encompass an epistemological standpoint which permits both the view that there is one true or real world (quantitative epistemology) and also that individuals have their own interpretations of the world (qualitative epistemology). This avoids the problems of combining methods from different epistemological standpoints and therefore incommensurability (Morgan, 2007). Bishop (2014) also advocates a pragmatic approach to mixed methods as she states that we cannot merely combine two methods without taking into account their different epistemological worldviews, for example constructionism and positivism; we must use an approach in our research which takes into account both of these standpoints which is what the pragmatic paradigm does.

3.2.3.3 Mixed methods research designs and typologies

Mixed methods research has gone through five stages of development: formative, paradigm debate, procedural development, advocacy and expansion, and the reflective phase (the latter of which is the current stage of development). Although mixed methods have been used since the late 1980s it was not until the early 2000s that researchers started to pull together the different approaches to mixed methods and classify the designs and typologies (Creswell & Plano Clark, 2011). There are two possible mixed methods study designs: fixed versus emergent (i.e. whether the use of mixed methods is planned or emerges during the research), and there are two approaches: typology-based versus a dynamic approach, although most studies use a typology-based approach. According to Creswell and Plano Clark (2011) and Bishop (2014) there are at least 15 mixed methods typologies. These typologies distinguish the levels of interaction between methods, the priority and timing of the methods, and where and how to mix the data (Creswell & Plano Clark, 2011). Studies can have a quantitative, qualitative or an equal priority, and the timing can be concurrent or sequential (other timings have also been suggested such as transformative and a multiphase combination).

The terminology and structure of these research designs have changed as mixed methods research has evolved, for example Creswell (2009) originally outlined three

sequential (explanatory, exploratory, and transformative) and three concurrent research designs (triangulation, embedded, and transformative). However more recent categorisations have emerged from the same researchers, some of which have the same names or similar characteristics to those listed above, although there are also distinct differences in timing. These six research designs are: convergent parallel, explanatory sequential, exploratory sequential, embedded, transformative, and multiphase designs (Creswell & Plano Clark, 2011).

3.3 Methods for measuring stress and coping

The discussion will now move from its focus on the different methodologies towards the research methods that have been used to collect data about stress and coping. Sarafino (2008) lists the three most frequently used measures of stress as: assessment of physiological arousal, life events and daily hassles. Other researchers have also used cortisol samples, questionnaires and interviews to assess stress response to laboratory based stressors (Westenberg et al., 2009). The programme of research outlined in this thesis utilises all of these methods to investigate stress and coping in children, and the methods were mixed between and within each of the three studies.

3.3.1 Experimental laboratory testing

The term 'stress testing' originated in engineering as the process through which the effectiveness of new software and devices were tested. The assumption is that if we know how a device works when under strain then we know the limits of its capacity. This term, and its underlying assumption, have also been applied to humans. For example, doctors use physical stress testing, such as a treadmill or exercise test, to determine how well a person's heart is working. In the 1990's this term began to be used in relation to people's psychological and physiological responses to social stress. The Trier Social Stress Test (TSST) was the first laboratory stress test developed to examine adults and children's biological responses to social stress, and is still the most widely used and adapted test (Buske-Kirschbaum et al., 1997; Kirschbaum, Pirke, & Hellhammer, 1993).

The traditional TSST presentation task involves public speaking and mental arithmetic in front of a live panel (Kirschbaum et al., 1993). Over 20 years since its inception, modifications and adaptions have included an adaptation for children called the TSST-C (Buske-Kirschbaum et al., 1997), a group style TSST-G (von Dawans, Kirschbaum, & Heinrichs, 2011), a virtual reality version and one using a computerised

paradigm (Jonsson et al., 2010; Zijlmans, Beijers, Mack, Pruessner, & de Weerth, 2013), a placebo version (Het, Rohleder, Schoofs, Kirschbaum, & Wolf, 2009), and a 'friendly' version (f-TSST) (Abelson et al., 2014; Wiemers, Schoofs, & Wolf, 2013). The latter two adaptations resulted in an expected lack of HPA axis activation. Similarly, focusing on helping others rather than on self-promotion lessens cortisol responses (Abelson et al., 2014).

The present research has also developed an adaptation to the standard TSST and TSST-C called the Bath Experimental Stress Test for Children (BEST-C). This test involved a child audience presented as a 'live' video link and was created and tested in studies one and three (see chapter four for details of the BEST-C procedure).

3.3.2 Physiological measures

A detailed description of the body's physiological response to stress was given in the literature review in chapter two, in which cortisol and heart rate were outlined as two key methods of assessing physiological activity. Cortisol acts as a measure of hypothalamic-pituitary-adrenal (HPA) axis activity whereas pulse/heart rate acts as a measure of the autonomic nervous system (ANS) which controls the fight or flight response (Sapolsky, 2004). The ANS has two branches: the sympathetic branch which allows the body to respond to stress by increasing heart rate, and the parasympathetic branch which helps the body return to homeostasis (Mikita et al., 2015).

When stress is encountered the body's neuroendocrine system is activated, causing changes in biomarkers such as cortisol, epinephrine, norepinephrine, dopamine and dehydroepiandrosterone (DHEA) (Read & Grundy, 2012). Stress, and the subsequent activation of these biomarkers, triggers activation in four secondary systems. These systems (and their biomarkers) include: the immune system (interleukin-6), metabolic system (triglycerides), cardiovascular and respiratory systems (heart rate, peak expiratory flow), and anthropometric system (body mass index; BMI) (Read & Grundy, 2012). Tertiary outcomes such as poor health are also impacted by stress, as has been discussed in chapter two.

Measurement of cortisol in saliva is a reliable, non-invasive method which does not cause any unnecessary distress, and is efficient when repeated assessments are required across a relatively short time period. The majority of laboratory based stress tests use this method for cortisol testing (Buske-Kirschbaum et al., 1997; Dickerson & Kemeny, 2004; Dorn et al., 2003; Gordis, Granger, Susman, & Trickett, 2006; Westenberg et al., 2009;

Yim, Quas, Cahill, & Hayakawa, 2010) as opposed to hair samples (which is still an exploratory method) and blood samples (which are invasive and potentially distressing). Heart rate can also be measured non-invasively using a finger pulse monitor which outputs heart rate data and blood oxygen levels.

3.3.3 Questionnaires

There are a range of standardised measures available for investigating the life events, daily hassles and coping styles of participants, however not all of them are suitable for use with children. A number of questionnaires that measure stress (major life events and daily hassles) and coping in children will be described below and the rationale for choosing the questionnaires used in the present study will be outlined.

3.3.3.1 Questionnaires to measure stress

The Perceived Stress Scale (PSS) was created to assess the extent to which people perceived the events in their lives as stressful (Cohen, Kamarck, & Mermelstein, 1983). It was first tested on university students and in community samples, however a recent review of the studies using the PSS conducted by Al Kalaldeh and Shosha (2012) found the scale to be a useful measure of stress in numerous populations, including school aged children, and had valuable applications to health and social issues. The PSS has also been adapted specifically for use with young people, for example it was modified for use with children who were involved in caregiving for a family member, and identified that some stress can be positive or beneficial, such as caregiving (Cassidy & Giles, 2013).

The Children's Stress Questionnaire was developed for use with primary-aged school children to investigate levels of stress in five areas: pervasive hassles beyond normal control, relationships with parents, the experience of transition and change, problems in the school environment, and family dissonance and upheaval (Byrne, Thomas, Burchell, Olive, & Mirabito, 2011). The scale was found to be useful in predicting relationships between stress and future mental health issues such as anxiety and depression 12 and 24 months later.

The Social Readjustment Rating Scale (SRRS) developed by Holmes and Rahe (1967) has a version for adults and a version for 'non-adults' which can be completed by children or their parents as proxy informers. The SRRS was selected for use in the present research as it rates the magnitude of certain life events rather than merely the number and type of stressful life events (Holmes & Rahe, 1967). It enables the researchers to collect

information about any stressful events that have occurred in the last year. The SRRS is a widely used measure of stress, however as it was created almost 40 years ago a group of researchers investigated how useful it is in the present day; they debated the content-related criticisms of the scale and found that overall the scale was still a useful measure of stress (Scully, Tosi, & Banning, 2000).

The daily hassles scale was developed in order to compare the existing major life events questionnaires with more minor daily hassles and uplifts, and found hassles to be a better predictor of present and future psychological issues than major life events (Kanner et al., 1981, 1987). Measures such as the 'everyday hassles in your life' scale have been used to examine hassles that have occurred for children in the last month (Turner-Cobb, Steptoe, Perry, & Axford, 1998; Turner-Cobb & Steptoe, 1998). Similar hassles scales have been developed specifically for children to assess negative feelings and daily events, such as the Daily Life Stressors Scale, however this was found to be only moderately valid and reliable for children (Kearney, Drabman, & Beasley, 1993). Due to the importance of considering both of these aspects of stress (life events and daily hassles) Kanner et al.'s (1981) daily hassles scale was used alongside the SRRS in the present research as it is the most reliable daily hassles scale.

3.3.3.2 Questionnaires to measure coping

Many scales have been designed to measure coping in adults however many of them lack a theoretical basis. One such exception is the COPE scale which is based on Lazarus and Folkman's (1984) stress and coping theory (Carver, Scheier, & Weintraub, 1989). This scale measures emotion-focussed coping, problem-focussed coping and coping responses which are deemed as less useful. It emphasises the importance of aspects of the stressor such as controllability, and individual differences of the participants such as coping styles (e.g. stable coping styles versus personality dimension derived coping styles). However, this scale has not been adapted for use with children.

Another questionnaire used to measure coping, this time in adolescents, is the Responses to Stress Questionnaire which, rather than categorising coping strategies into problem and emotion-focused coping, categorises coping as volitional and involuntary (i.e. intentional and spontaneous coping) (Connor-Smith et al., 2000). The questionnaire was found to correlate well with other measures of coping, heart rate and self and parent-report. Again, this scale has not been adapted for use with younger children.

An established measure of coping for children and adolescents is the Kidcope (Spirito, Stark, & Williams, 1988). It was created because coping strategies have been studied extensively in adults but less so in children and it has been used in both healthy and ill child populations. The Kidcope requires participants to describe a problem that they have encountered and to use a Likert-type scale to rate their answers to three questions about how the problem made them feel. The measure uses fifteen questions to address ten categories of coping: distraction, social withdrawal, cognitive restructuring, self-criticism, blaming others, problem solving, emotional regulation, wishful thinking, social support and resignation. The Kidcope was used in the present programme of research as it is the most appropriate questionnaire for assessing coping in a child population.

3.3.4 Interviews

Some qualitative interview schedules have been created to investigate these topics, however there are three main issues with the existing interview protocols that make them unsuitable for the population in the present research. Interviews often use the parents of children as proxy respondents rather than speaking to the children themselves, and when children and their parents have been interviewed it has been separately rather than together. Many of the interview protocols that exist have a strong focus on mental rather than physical health. Therefore, there is clearly a gap in the research in relation to developing an interview protocol which could investigate children's and parent's views about life stress, coping and illness.

Examples of child stress interviews which use the parent as a proxy measure include structured interviews examining post-traumatic stress disorder (PTSD) in parents of childhood cancer survivors (Alderfer, Cnaan, Annunziato, & Kazak, 2005), and structured interviews assessing stress in survivors of war and mass violence (de Jong, Komproe, Spinazzola, van der Kolk, & Van Ommeren, 2005).

However, research has emphasised the importance of including the child's perspective, especially in relation to coping and perceived stress (Amer, 1999). Therefore, some interviews about stress have been conducted with children rather than their parents. The interview protocol which has been used in the majority of child stress interviews is the UCLA Life Stress Interview which is semi-structured and focuses on a range of stressors across key life domains including illness (Hammen, Hazel, Brennan, & Najman, 2012; LeBovidge, Lavigne, & Miller, 2005; Raposa, Hammen, Brennan, O'Callaghan, & Najman, 2014). Other stress-related interview protocols include the Youth Life Stress

Interview (Gershon et al., 2011; Rudolph, 2008) which assesses the impact of different types of stress on psychiatric disorders, the Life Events Interview (LEI) which is an expansion of the Life Events Scale (Wagner, Abela, & Brozina, 2006), and the UCLA Chronic Stress Interview which considers chronic family stressors and depressive symptoms (Jenness, Hankin, Abela, Young, & Smolen, 2011).

In some studies, both the child and the parent were interviewed about stress to gain both perspectives, however they were always interviewed separately. Interview schedules such as the Youth Life Stress Interview were used with both adolescents and their caregivers (Abaied & Rudolph, 2011; Flynn & Rudolph, 2011) as well as the LEI (Shih, Abela, & Starrs, 2009). Similarly, an interview protocol called the Impact of Traumatic Stressors Interview Schedule has been used to assess PTSD in survivors of childhood cancer and their parents (Kazak, Stuber, Barakat, & Meeske, 1996). Noticeably these interviews focused more on the impact of stress on psychopathology than children's experiences of, and feelings about, stress.

There have been some interview protocols developed that do not focus on psychopathology, but instead investigate areas such as stress, coping and health. The interviews with a focus on health and illness included interviewing children about their psychological adjustment to sickle cell disease (Hurtig & White, 1986), the impact of illness and coping strategies used by children and their families (Jackson, Tsantefski, Goodman, Johnson, & Rosenfeld, 2003), and experiences of uncertainty for childhood cancer survivors (Parry, 2003). Interviews with children about stress included the Child Life Stress Interview (Marin et al., 2009), the Cambridge early experience interviews (St Clair et al., 2014), structured interviews addressing specific stressors (Band & Weisz, 1990), semi-structured interviews about stressful events and social support (Gustafsson et al., 2002), and interviews assessing children's views on a mindfulness-based intervention (Costello & Lawler, 2014).

3.4 Analysing and integrating mixed methods data

3.4.1 Quantitative analysis

Quantitative data such as cortisol levels and questionnaire responses can be analysed using descriptive and inferential statistics in SPSS. In order to analyse the data using variations of MANOVA (including MANCOVA) and correlations certain assumptions must be met, for example data must be normally distributed, equality of variance and univariate and multivariate outliers must be checked for, there must be a

linear relationship between the dependent variables for each group of the independent variables, there must be homogeneity of variance, no multicollinearity and an adequate sample size. The majority of these assumptions can be addressed during the data screening stage based on recommendations from Field (2009) and Tabachnick and Fidell, (2007). An appropriate sample size can be calculated using G*Power (for data screening and power calculations for the quantitative data in this programme of research see chapter four and chapter six).

3.4.2 Qualitative analysis

Qualitative data can be coded by hand or by using computer assisted qualitative data analysis software (CAQDAS) such as NVivo; the latter was used in the present research as it can aid analysis in terms of speed and rigour especially with large data sets (Silverman, 2013). There are a range of analytic methods available for analysing qualitative data, for example thematic analysis (TA), interpretative phenomenological analysis, grounded theory, discourse analysis, conversation analysis, and narrative inquiry (Braun & Clarke, 2013; Forrester, 2010). Many of these types of analysis have sub-types e.g. TA can be inductive, theoretical, experiential or constructionist. Inductive TA is a bottom up approach which generates an analysis without drawing on existing theory, theoretical TA uses existing theory, experiential TA gives emphasis to how participants make sense of the world, and constructionist TA concentrates on how topics and the world are constructed (Braun & Clarke, 2013). Inductive TA was chosen as the analytic method for the current programme of research as it allows for a bottom up approach which is appropriate for exploratory work, therefore this analysis will now be discussed in detail.

Thematic analysis aims to "produce insights into the meaning of the data that go beyond the obvious or surface level content" by looking for patterns across the data (Braun & Clarke, 2013, p. 201). It is understood that ideas which appear in the accounts given by a number of participants tell us something meaningful about that population and topic. When analysing data it is important to bear in mind that there is not a single meaning to people's experiences but multiple meanings. Therefore it is important to treat participants accounts as "skilfully structured stories" to create an informed analysis of the data (Silverman, 2013, p. 47). TA allows the researcher to tell one particular story but not every story held within the data.

In TA there are seven stages of analysis: transcription, reading and familiarisation, coding, searching for themes, reviewing themes, defining and naming themes, and writing

up the analysis (Braun & Clarke, 2013). Coding the data can be done completely across the whole data set or selectively if the researcher is looking for particular illustrations of a topic that they are interested in. The data in the present study was completely coded so all possible themes could be explored. This was done because the research questions were broad and the interviews were exploratory as very little research has considered children's experiences of stress. The codes created from this analysis were a combination of data-derived and researcher-derived codes; data-derived codes are those which summarise the semantic meanings in the data (i.e. more descriptive) and researcher-derived codes are latent codes which identify implicit meanings in the data (i.e. more interpretative). When complete coding has been carried out it is important to collate any similar codes as this will help with the development of themes. Themes must have a "central organising concept" that is meaningful and not just a feature of the data (Braun & Clarke, 2013, p. 224).

The language used to describe thematic analysis matches the level of interpretation required during analysis, for example finding themes is an active rather than a passive process therefore themes are 'identified' rather than 'emerging' (Braun & Clarke, 2013). Other relevant language includes the use of hierarchical terms to refer to the different levels of themes, such as overarching themes, candidate themes and sub-themes. At the top of the hierarchy are overarching themes which describe an idea captured in a number of candidate themes. Candidate themes (often referred to simply as themes) are therefore ideas that have arisen from the data, and sub-themes encapsulate particular aspects of each candidate theme. Data extracts (i.e. quotes from participants) are used to illustrate the candidate themes and sub-themes and TA allows for them to be analysed illustratively or analytically; these two approaches correspond to whether the researcher is taking a more descriptive or interpretative approach to data analysis. An interpretative approach goes beyond mere description of what people said and discusses what is interesting about the data extract and why.

Thematic analysis has a number of strengths and weaknesses; its strengths include flexibility in relation to theory and methods, accessibility due to its straightforwardness and being fairly quick and easy to learn, and that the findings are understandable to most audiences (Braun & Clarke, 2013). However its weaknesses are the limited interpretation due to its lack of a theoretical foundation and absence of guidance for deeper interpretative analysis, the view of others that TA lacks the 'substance' of other theoretically based approaches, does not focus on the continuity or contradictions between participants as it focuses on patterns, and does not focus on language (Braun & Clarke, 2013).

3.4.3 Mixed methods analysis

It is clear from the description of mixed methods designs and typologies earlier in this chapter that qualitative and quantitative aspects of a study can be integrated at various points in the research process. Mixing methods allows researchers to make inferences across the quantitative and qualitative data. Different mixed methods theorists use different terminology to describe the processes available for mixing methods, for example Sandelowski, Voils, Leeman, and Crandell (2012) suggest that mixed methods can be synthesised by aggregation or by configuration. Synthesis by aggregation focuses on thematically similar findings which confirm the findings of each method and produce a pooled summary, whereas synthesis by configuration focuses on dissimilar findings which can be assembled coherently to produce a theory or model (Sandelowski et al., 2012). Alternatively, Creswell and Plano Clark (2011) refer to merging, transforming and connecting data (depending on whether the design of the study was convergent, explanatory or embedded), Symonds and Gorard (2008) use the term integration of methods, and Duran (2013) refers to a narrative synthesis of findings.

3.4.4 Quality criteria for mixed methods research

Quality criteria for quantitative research usually revolve around validity and reliability. Validity refers to how much a concept or measure reflects the real world. The most established types of validity include content validity and construct validity (Creswell & Plano Clark, 2011; Tashakkori & Teddlie, 2010). There are other types of validity and names for these types vary between different methodological scholars. Content validity refers to whether the items on a measure truly represent the relevant items, whereas construct validity concerns whether scales measure what they aim to measure (Creswell & Plano Clark, 2011). Reliability refers to the consistency and stability of scores or concepts over time therefore it is usually accompanied by a test-retest score (Creswell & Plano Clark, 2011). Another issue of relevance to quantitative research is the generalisability of findings which is why studies require large sample sizes, in order to ensure that the sample is truly representative of its population.

However these quantitative methods of quality control are not all applicable to qualitative data because they imply a positivist approach, therefore other methods for assessing quality are required (Silverman, 2013). Before discussing the quality criteria relevant to qualitative research this section will first focus on some of the criticisms of qualitative research and their possible solutions. Braun and Clarke (2013) raise the issue of

the generalisability of findings, a concern which is frequently cited as a criticism of qualitative research. These researchers suggest that there are different types of generalisability, some of which can be applied to qualitative research (e.g. contributing to knowledge) and some which do not apply (e.g. due to sample size and lack of statistical generalisability).

Another criticism regarding the quality and depth of interpretation of some published qualitative research comes from Sandelowski and Barroso (2003) who reviewed and critiqued 62 qualitative studies in the area of health research in terms of the level of interpretation in the findings of these studies. They found five levels of data transformation ranging from: no findings (i.e. little to no interpretation of the data), topical surveys (lists of topics discussed by participants), thematic surveys (describing themes or patterns), conceptual or thematic description (concepts developed from the data or theory), and interpretative explanation (the transformation of data into theory and cohesive explanations of events). The latter was the highest level of data transformation and was found in very few of the studies, and the reviewers suggested that the level of analysis researchers claimed to have done often did not correspond to their findings (Sandelowski & Barroso, 2003). Efforts have been made in the present research programme to ensure that the higher levels of interpretation have been met by the analysis.

Some of the suggested quality criteria for qualitative research include that the research be persuasive, which could be ensured by using member checking, triangulation, and inter-coder agreement (also known as inter-rater reliability) (Creswell & Plano Clark, 2011). Braun and Clarke (2013) also list member checking and triangulation as useful quality assessments however they see inter-rater reliability as problematic as it assumes that coding "can and should be objective" (p. 279). Checklists have been suggested as being potentially helpful for enhancing rigour in qualitative research, however researchers must be mindful of not allowing overly prescriptive lists to lead the research into what some researchers have called "a case of the tail wagging the dog" (Barbour, 2001, p. 1115). Rather, qualitative research needs to be embedded within a good research design.

Some mixed methods researchers have stated that no additional quality criteria are required for mixed methods research, but that the appropriate quality criteria should be used for each method (i.e. qualitative criteria for qualitative methods and quantitative criteria for quantitative methods) (Bishop, 2014). However, other researchers have created 'theoretically neutral' quality criteria which can be applied to both quantitative and qualitative research methods and include ensuring that research is sensitive to context,

rigorous, transparent and coherent, and has a practical or applied impact (Yardley, 2000, 2008). These quality criteria have been met by the present research due to the clear and detailed discussion and justification of the methods and type of analysis used. In a review of mixed methods studies in primary care Creswell et al. (2004) emphasised the importance of appropriate mixed methods analysis such as triangulation and data transformation as a way to ensure rigour in mixed methods research.

3.5 The use of mixed methods in the present research programme

3.5.1 Rationale for the use of mixed methods

According to Creswell and Plano Clark (2011) there are a variety of different reasons or 'needs' for doing mixed methods research. These needs include: the need to explain initial results, to generalise exploratory findings, to enhance a study with a second method, to understand a research question through multiple research phases, or because one data source is not sufficient. The present research used mixed methods to fulfil the latter two needs; the research was exploratory and used methods not previously used in association with social stress testing (e.g. interviews) to better understand children's responses to stress. The research required multiple phases of study so that knowledge from the initial studies could guide the design and interpretation of future studies, and due to the exploratory nature of the research programme it was essential to use more than one data source to provide a fuller picture of children's experiences of stress and coping. Other researchers have also gathered together the reasons for carrying out mixed methods research; these reasons include triangulation of methods and/or findings, ensuring completeness and credibility, having different research questions for each method to answer, providing context, and illustration (Bryman, 2006; Creswell & Plano Clark, 2011; Greene, Caracelli, & Graham, 1989).

3.5.2 The mixed methods typology and analytic strategy used in the present research

The current programme of research has embraced a pragmatic mixed methods approach in which the emphasis has been placed on using the most appropriate methods to answer the research questions rather than one particular method. Using the Creswell and Plano Clark (2011) terminology, each of the three studies in this research project have used an embedded research design. In study one and study three quantitative research took priority and in study two qualitative research took priority, however the studies were also part of a multiphase design in which each study followed on from the previous studies (see

Figure 3.1). This design enabled the quantitative and qualitative results to be directly compared.

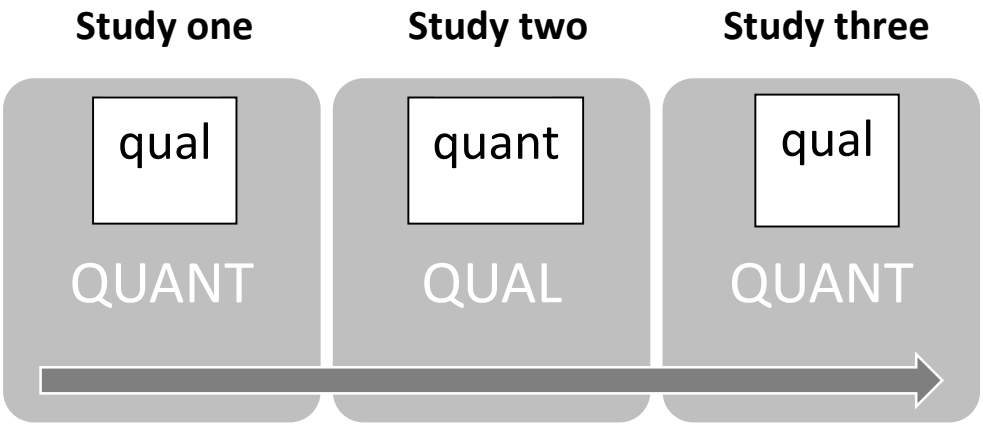


Figure 3.1. Diagram of the embedded and multiphase design used in the present programme of research. *Note.* Capitalisation of words is used to designate the priority of the research, whether that is qualitative, quantitative or equal priority

A number of analytical methods were used to integrate the mixed methods data in the present study; qualitative data from study one and two was analysed qualitatively using thematic analysis and it was also analysed quantitatively by coding the data into groups. This method of analysis is referred to in the mixed methods literature as data transformation as it involves transforming one type of data into another; in this case qualitative into quantitative data. The qualitative and quantitative data in all three studies was synthesised by aggregation as the focus of the analysis was on the similarities between the two types of data collected.

3.6 Conducting research with children

3.6.1 The history of child health research

Research with children has been approached from a number of theoretical standpoints, most notably Freud's psychoanalytical theories, ethological and evolutionary theories, learning theories, cognitive-developmental theory and social ecological theory (Greig & Taylor, 1999). These theories have practical implications for the research that they guide, for example psychoanalytical and ethological theories emphasise the importance of early childhood experiences on children's social, physical and emotional development, and social ecological theory suggest that researcher must consider the child

within their social context (Greig & Taylor, 1999). These are important considerations even when the research is not guided exclusively by one of these theories.

Several major themes have emerged from the research conducted with children across different disciplines; these include learning, adolescent deviance and delinquency, children's relationships, and child health and illness (Greig & Taylor, 1999). The latter two themes are of particular relevance to the present research. Children's relationships with their primary caregivers has been an area of key interest for researchers since the work of Bowlby (1951) which emphasised the importance of early caring relationships on children's ability to bond with others across the life course. Such research has continued, particularly in relation to attachment, changing family dynamics and the impact of early experiences on later life (Greig & Taylor, 1999). Research on the health and illness of children has changed dramatically over the years as medical advancements have reduced the number of deaths in childhood. The focus is now more concerned with morbidity and children living with acute and chronic illnesses than mortality (Greig & Taylor, 1999).

The present research will focus on some of these topics in relation to children's experiences of stress, coping, and illness. Researchers have aimed to define the term 'experience' in relation to the perspective of studying children's experiences, with some suggesting that it is the consciousness of being affected by an event that makes something an experience and that this can be influenced by social and cultural perspectives (Greene & Hogan, 2005).

3.6.2 Practical challenges in conducting research with children

Several researchers have stressed the importance of considering children's perspectives about their experiences and not relying on parental responses alone; young children are more competent and able to provide insight into their lives and experiences than some researchers believe (Greig & Taylor, 1999; Irwin & Johnson, 2005). However there is little practical guidance available about conducting interviews with children (Greig & Taylor, 1999). Therefore, in the hopes of guiding future research, Irwin and Johnson (2005) outlined their research practices and dilemmas, giving useful examples from their own research with child participants. For instance, children who gave one word answers to open questions and those who opened up more with a combination of open and closed questions. These illustrations are vital knowledge when conducting research with children, because interviews with children do not seem to completely capture all the criteria for 'good' qualitative interviews, e.g. the transcribed interviews tend not to be solid blocks of

text like they are in interviews with adults. However, Irwin and Johnson (2005) suggest that this is normal when interviewing young children.

When interviewing children, key concepts that need to be considered include children's developing perception of time and their memory capacity; the latter could mean prompts such as toys or parental input are required to stimulate memory (Greig & Taylor, 1999). Children can also be vulnerable to suggestibility and denial, which researchers should keep in mind when designing questions and prompts. A variety of methods have been used when conducting research with children, ranging from observation, to individual or group interviews, and creative methods such as drawing or using puppets. It has been suggested that if using interviews with children it is useful to use a semi-structured format so to allow the conversation to flow naturally but also to keep questions focused around the topic of interest. Breaking up the question-answer format of interviews by including other tasks has also been suggested by numerous researchers (Greene & Hogan, 2005; London School of Economics, 2010; Shaw, Brady, & Davey, 2011).

Other practical considerations include building rapport, interview structure, interview setting (i.e. allowing participants to choose the setting), leading questions, parent's presence, and recognising data value (Irwin & Johnson, 2005; Shaw et al., 2011). Direct questions at the beginning and some closed questions throughout can help the interview seem more conversational and therefore normal for the child participants. Interruptions (e.g. from siblings, parents, pets, etc.) are to be expected and contextualise the child's experiences. Researchers should be prepared to go off topic if the child wants to talk about something else as this can help them to feel more comfortable. If children struggle to explain a term they have used, a 'shopping list' of terms could be provided for them to choose from, but children have their own systems of meaning so researchers should be mindful of not putting words into children's mouths, but to let them find the words themselves (Irwin & Johnson, 2005).

The present research utilised a technique which involved interviewing parent-child dyads together, a technique that was chosen because research suggests that child and parent input can complement each other because "parent's scaffolding of stories adds a richness and completeness" to the data provided by children (Irwin & Johnson, 2005, p. 827). This technique is a useful way to incorporate the views of children and their parents, something which has not previously been considered in health or stress research.

3.6.3 Reflections on the methodological challenges in the present research programme

As detailed in the previous section there are a number of practical considerations to take into account when interviewing young children. The present research programme emphasised the importance of collecting data from both children and their parents in order to gain a holistic view of children's experiences. This involved parental scaffolding of children's narratives. It is import to reflect on this research process, particularly the methodological and ethical challenges that arose during the qualitative work.

One of these methodological issues was discussed in the section on practical challenges in conducting research with children in the methodology chapter. This section discussed the importance of adapting the interview technique to be suitable for young children, such as by using a mixture of open and closed questions, and breaking up the interview with more interactive tasks. These methods worked well within the present study, along with the methodological decision to incorporate both children and their parent's voices using a scaffolding technique. However, when using a child-parent dyad interview technique it is important to be mindful of issues such as the importance of voice and power dynamics. It is essential that the participants (both the children and their parents) were able to discuss their experiences of stress in order to have their narratives fully expressed. However, the research process is collaborative and so the researcher's voice will also have had an impact on the topics discussed and themes identified. When critically reflecting on these interviews it is clear that the researcher's beliefs and perspectives will have impacted the research findings and conclusions. In particular, the researcher's social position as a middle class white woman, as discussed earlier in relation to the social class of the sample, provided a lens through which to view the narratives.

It is ethically relevant to note at this point, that the majority of parents interviewed were also middle class white women and therefore there may have been some inter-subjectivity between the researcher, parents and children due to their collective middle class identity and potential for shared meanings about stress, coping and health. As mentioned above, there could have been power dynamics at play during the interviews because parents were present during the interviews with the children. Children may have altered or modelled their opinions and stories in light of the input given by their parent, or could have felt they could not express how they felt in front of their parents. The relationships between child and parent would clearly have had an influence on this dynamic during the interviews. For example, an attuned parent-child dyad may have felt

more comfortable expressing differing opinions than a child and parent with a less attuned relationship. These are all important considerations to take into account when using the child-parent story scaffolding interview method.

3.7 Ethical considerations

The British Psychological Society (BPS) outlines the key ethical considerations when conducting research as: consent, deception, debriefing, withdrawal, confidentiality, and protection of participants. Working with vulnerable populations is also an issue in the current programme of research as the participants involved were young children, therefore it is even more important to be mindful of ethics (Silverman, 2013). In each of the three studies in the present programme of research the parents and children were given detailed information about the study before consenting procedures took place. Participants were informed of their right to withdraw from the study and that their data would be anonymised and kept confidential on the information sheet, consent form and verbally by the researcher. Confidentiality and anonymity were ensured by giving each participants' data a number, rather than including individual's names with their data. Parents signed a consent form and children were asked for their verbal assent.

In order for the stress test used in study one and study three to be convincing and induce a natural stress response these studies involved minor deception. Prior to the experiment participants and their parents were told that the child would perform a speech and maths task in front of a panel of their peers (via a live video link) and that they were being recorded by a video camera. During the debrief it was explained to participants and their parents that the video was pre-recorded and the video camera was not switched on. The child was also told that the test was designed to be scary and that they performed very well.

The research did not involve anything which could have caused physical or mental harm to the participants, although the interviews did discuss stressful life events which could have caused the participants mild distress. Across the three studies only four participants became distressed during the interview or stress test and they were comforted by their parent and the researcher and told they could stop participating if they wished (only one child chose to withdraw from the stress test). Details of relevant charities and counselling services such as the Samaritans were provided on the information sheet in case of continued upset, although this was unlikely to have occurred. An up-to-date researcher

CRB/DBS check ensured protection of the participants and the researcher followed the NHS lone worker policy when interviewing children at their homes. This policy required a responsible person to know where the researcher was, how long they were there for and to ensure a means of communication between the researcher and responsible person (e.g. mobile phone contact immediately after the interviews).

Two other ethical considerations are of relevance to the present programme of research, and these were access to child participants through gatekeepers and payment of participants. As children are dependent upon their parents, researchers must seek to recruit them through gatekeepers such as parents and schools (Greene & Hogan, 2005). This is an important consideration in relation to consent, as if the parent makes the initial contact with the researcher the researcher must also ensure that the child understands the research and wishes to take part. Therefore, in the present programme of research, the studies were verbally explained to the child participants and their verbal assent was gained (along with written parental consent). The issue of parents as gatekeepers can also mean that study samples are quite homogenous as only parents who are interested, or have a background, in research are likely to put their children forward for research participation. However, in the present studies there was a range of parents not from research backgrounds who chose to participate based on an interest in learning more about their children's feelings and behaviour (Morrow, 2013).

Payment of participants, especially child participants can be seen as coercive and could interfere with children giving informed consent freely (Morrow, 2013). However it can greatly aid with recruitment and retention (if the study involves several phases) and allows the researcher to thank participants for their time and effort in the research process (Greene & Hogan, 2005). In the present research participants were paid for their participation, however this did not have a coercive effect because the researcher ensured that participants were made aware that the payment did not interfere with their right to withdraw. Children who did withdraw from the research were also paid (in this case only one participant). The three research studies reported in this thesis gained ethical approval from the Department of Psychology's ethics committee.

Chapter four: Study one

4.1 Chapter overview

This chapter outlines the creation of a new social stress testing paradigm for children and its ability to elicit a stress response. Adult and child social stress testing involves performing a public speaking and maths task in front of an adult audience. Adult participants typically show an increase in cortisol in response to this task, whereas the findings in research with children are mixed. Therefore, the present study aimed to create a more meaningful stress test for children, the Bath Experimental Stress Test for Children (BEST-C), using an age-matched child audience. The 33 child participants (aged seven to 11 years) completed questionnaires about stressful life events, daily hassles and coping strategies followed by the 10 minute BEST-C task. Salivary cortisol was assessed at four time points and children were interviewed post-task about their experience.

The BEST-C was shown to be effective at increasing cortisol in the majority of the children, with a reduction towards baseline in the recovery period. The interviews were coded qualitatively (using thematic analysis) and quantitatively (which enabled grouping of the cortisol data into three distinct response patterns). These patterns reflected differences in stress reactivity and recovery: i) expected response and recovery; ii) expected response, no recovery; iii) no response. The interviews yielded three overarching themes: presence of an audience, emotions as time and task-dependant, and drawing on personal resources to aid coping.

The findings from the present study suggest that the BEST-C is a meaningful stress testing paradigm for children, and emphasises the importance of collecting qualitative data about children's experiences as well as biological measures. Based on the conclusions from study one, study two looked in more depth at children's experiences of stress, coping and illness, and study three further assessed the validity of the BEST-C using salivary cortisol and a second physiological measures (heart rate).

4.2 Contributions to this chapter

This study has been published in Psychoneuroendocrinology (PNEC). The reference for this manuscript is: Cheetham, T. J., & Turner-Cobb, J. M. (2016). Panel manipulation in social stress testing: The Bath Experimental Stress Test for Children (BEST-C). *Psychoneuroendocrinology, 78-85,* DOI: 10.1016/j.psyneuen.2015.09.013.

Sections of the present chapter are taken directly from the published manuscript, particularly the introduction, quantitative results and discussion, although large sections of this chapter do not appear in the manuscript. The student, Tara Cheetham (TC), and Dr Julie Turner-Cobb (JTC) developed the research questions and methodological approaches of the study. The BEST-C video was created by JTC and Tim Gamble (TG) and TC collected the data. TC wrote the manuscript with guidance and editing from JTC. Both TC and JTC responded to reviewer comments and carried out revisions on the manuscript during the submission process. TC is the primary author on the manuscript. The full published manuscript can be found in Appendix A.

4.3 Introduction

4.3.1 Social stress testing

Psychological stressors (threats to the social self or self-esteem) are triggered by social evaluative threat (SET), activating the hypothalamic-pituitary-adrenal (HPA) axis and resulting in elevated cortisol release (Dickerson et al., 2009; Dickerson & Kemeny, 2004; Gunnar, Talge, et al., 2009). SET coupled with lack of control over the environment, laboratory social stress tests such as the widely used Trier Social Stress Test (TSST), have consistently elicited a stress response-recovery pattern in adult populations (Kirschbaum et al., 1993). Yet laboratory social stress testing in children has yielded inconsistent findings (Dorn et al., 2003; Gordis et al., 2006).

The traditional TSST presentation task involves public speaking and mental arithmetic in front of a live panel (Kirschbaum et al., 1993). The presence of a live panel is a key element in social stress testing. However, for practical reasons it may not always be feasible. Use of a pre-recorded 'virtual audience' circumnavigates this. Dickerson, Mycek, and Zaldivar (2008) demonstrated that the link between performance and cortisol response is due not to mere social presence but to SET. A further adaptation of the TSST addressed this using a virtual reality (VR) TSST in which participants performed tasks using a head tracking system in front of a virtual environment (Jonsson et al., 2010). Use of virtual reality is gathering momentum in adult stress testing and is suggested as an effective alternative to a live audience (Montero-Lopez et al., 2015; Wallergard, Jonsson, Osterberg, Johansson, & Karlson, 2011). A pre-recorded audience was applied in the Leiden public speaking task with a panel of adolescents in a classroom setting, eliciting a moderate stress response in adolescents aged 12-15 years (Westenberg et al., 2009). Similarly, a video audience of adolescents and a teacher who displayed ambiguous natural behaviour rather

than negative social evaluation has been used with the Leiden public speaking task (van den Bos et al., 2014).

Adaptations to the TSST have also been made to evaluate stress responses in children. The TSST-C adapted the speech (completing an unfinished story) and maths (serial subtraction in 7's) tasks whilst retaining a panel of two adults who gave positive, rather than negative, feedback (Buske-Kirschbaum et al., 1997). The TSST-M modified the speech task component by asking children to imagine introducing themselves to a new class, and reduced the duration of the tasks (Yim et al., 2010) but retained an adult panel. Whilst equivalence of the component tasks has been addressed in child stress testing, an age disparity between participant and panel remains.

Evidence for laboratory based social stress testing in children is inconclusive. Most studies of adolescents (aged 13 plus) show an increase in cortisol in response to a stress test but findings for children below this age have been inconsistent. Buske-Kirschbaum et al. (1997), Gordis et al. (2006), Yim et al. (2010) and de Weerth, Zijlmans, Mack, and Beijers (2013) all found an increase in cortisol; Dorn et al. (2003) found no significant increase; and Westenberg et al. (2009) found only moderate responses. In a review of child stress paradigms, Gunnar et al. (2009) reported that only 12 out of 17 studies using public speaking tasks showed an increase in cortisol production. Explanations for this lack of response have been linked to a hypocortisolaemic period in pre-pubescent children (Hankin et al., 2010). Post infancy until early puberty, children show a diminished basal cortisol level and less reactivity to stress (Gunnar & Donzella, 2002). Whilst this may serve an evolutionarily protective function during brain development (Lupien et al., 2009), there is uncertainty surrounding the extent of this hypocortisolaemic state. The reliability of social stress tests to elicit a cortisol response in children under 13 years of age therefore presents an ongoing debate.

In adult stress testing, participants perform in front of an adult panel yet in child stress testing peers have not been age matched, with the exception of work by Westenberg et al. (2009) and van den Bos et al. (2014) with adolescents. Performing in front of an adult panel has the potential to create a power dynamic in children that does not exist in adult testing. Removing this dynamic would make the child and adult stress tests more comparable and ecologically valid since peer interaction and evaluation is a key aspect of a child's natural environment (e.g. Gunnar, Sebanc, Tout, Donzella, & van Dulmen, 2003).

4.3.2 The impact of stress experiences on acute stress responses

There is also evidence that underlying chronic stressors or past stressful experiences may influence reactivity in acute stress situations. For example, Marin, Chen, Munch, and Miller (2009) report a combined effect of exposure to underlying chronic family stress and acute stress events in children with asthma. The complex nature of stressful events, referred to as "compound stressors" (Michaud et al., 2008) is also evidenced in prior life event stress influencing cortisol response to the acute stress of starting school (Turner-Cobb et al., 2008). Long-term memory of prior stressful events appears implicated in acute stress responses (Montirosso, Tronick, Morandi, Ciceri, & Borgatti, 2013). Early life stress (before age 16 years) can also negatively diminish acute laboratory stress responses in young adolescents (Lovallo, 2013). Furthermore, coping can act as a moderator in the TSST (Abelson et al., 2014).

4.3.2 Aims of the research

The primary aim of the present study was to create a modified social stress test based on the core characteristics of the TSST and TSST-M but with the panel manipulated to address the age disparity with participants. This modified stress test, the Bath Experimental Stress Test for Children (BEST-C), was designed to create a more meaningful environment for children by enlisting children rather than adults on the panel. The BEST-C utilises a pre-recorded child panel delivered via a sham live video link to participants aged seven to 11 years. It also includes a post-test interview to assess subjective stress to compare with the objective stress response assessed via salivary cortisol. It was hypothesised that children would exhibit an increase in cortisol in response to the BEST-C, followed by post-test recovery. Those reporting more underlying stressful life events, daily hassles, and use of less effective coping strategies were expected to demonstrate greater cortisol reactivity and slower recovery.

4.4 Method

4.4.1 Participants and recruitment

This study was granted ethical approval from the Department of Psychology ethics committee on 19th April 2013 (ethics reference number: 13-043). An opt-in recruitment method with advertisements in local newspapers, schools, and sports clubs was used to recruit children aged seven to 11 years old. Exclusion criteria included oral steroid medication, chronic mental or physical illness or special educational needs (SEN).

Recruitment methods included displaying a press release for the study on the University of Bath website, Twitter feed, and in three local newspapers. The press release was also sent out in faculty/departmental emails to staff and postgraduate students, and in an email from the university sports centre to the parents of children attending sports clubs on the university campus. The researcher was interviewed about the study on a local radio station and spoke at a tennis parents evening at the sports centre at the university. Letters and flyers were sent to 62 schools in the local area inviting children to participate in the research. One participant's parent and one school offered to advertise the study in school newsletters. The email to local sports clubs was the most successful recruitment method (attracting 14 participants), followed by the emails to university staff/students (five participants), newspaper advertisements (five participants), school newsletters (four participants), university website (four participants), and the tennis parents evening (one participant).

Thirty-three participants (17 boys and 16 girls) took part in the study. Demographic information such as age, sex, ethnicity, and socioeconomic status (SES) are reported in the results section. The number of participants was derived from a G*Power calculation which suggested a sample size of 32, based on conducting a MANOVA with a medium effect size of 0.3 (as indicated by the Yim et al., 2010 findings), an alpha of 0.05 and power of 0.80.

4.4.2 Measures

4.4.2.1 Questionnaires: Demographics, life events, daily hassles and coping strategies

Demographic details and a life events scale were completed by the child's accompanying parent. The demographics questionnaire requested information concerning parental occupation and qualifications (SES factors), and child age, sex, ethnicity, height, weight and body mass index (BMI). The Social Readjustment Rating Scale (SRRS) is a list of stressful life events that impact health for adults but which has been adapted for children and adolescents (Holmes & Rahe, 1967). This scale is widely used in the literature and was judged to be a good measure of life events in a review assessing its use over 30 years of research (Scully et al., 2000) and the adult version has test-retest reliability of r=.71 over a six week period (Horowitz, Schaefer, Hiroto, Wilner, & Levin, 1977). It gathers information about stressful life events that have happened in the last year such as death or divorce of parents, changes in acceptance by peers, and hospitalisation of a sibling. Parents recorded a yes or no answer on behalf of their children for each of the 31 items. Space was

provided at the end of the questionnaire for participants to include any additional life events not listed that had occurred in the past year.

Assessment of daily hassles and coping styles were completed by the child participant with assistance in reading and writing from their parent as necessary. The Children's Hassles Scale collected information about hassles that had occurred in the last month (Kanner et al., 1987). The scale has been found to have high levels of predictive validity, with more frequent hassles associated with more emotional distress (Blount et al., 2008) and the adult version of the scale had test-retest averages of r=.79 for frequency of hassles and r=.48 for intensity of hassles (Kanner et al., 1981). The 34 item scale included hassles such as falling out with friends, being punished for doing something wrong, and having trouble finishing homework. If the event had happened to them in the past month, children were asked to rate whether they felt 'ok', 'quite bad' or 'very bad'; the options were accompanied by pictorial representations of these emotions.

The Kidcope questionnaire for children aged five to 13 was used to measure children's coping responses to a specific stressor (Spirito et al., 1988). This scale was found to have high test-retest reliability using Pearson's correlation for all questionnaire items when tested three days apart (range = .56 to .75) and six of the 10 items when tested one week apart (range = .41 to .83) (Spirito et al., 1988). The child was asked to first 'think of a time when you had a problem that bothered you' and briefly describe this problem. They were then asked three distress questions: whether the problem made them feel nervous or anxious, sad or unhappy, and cross or angry. Children rated these distress items on a five point Likert scale (from 0 to 4) with 0 being 'not at all' and 4 being 'very much'. Participants were shown a list of 15 coping strategies and asked to answer yes or no as to whether they used these coping strategies to help with the problem they had described. If they answered yes they were asked how much that strategy helped on a three point Likert scale (from 0 to 2) with 0 being 'not at all' and 2 being 'a lot'.

4.4.2.2 Stress paradigm: BEST-C

The BEST-C was used as the social stress test. Based on the original TSST (Kirschbaum et al., 1993) and the child related modifications (TSST-M) made by Yim et al. (2010) it involves a ten-minute verbal presentation and mathematical challenge in front of a panel who elicit SET by failing to provide positive feedback. The main adaptations to the BEST-C involve the use of a child panel of the same target age group as the child participants and a video audience; therefore the BEST-C does not require the audience to

be physically present in the same room as the participant. Participants were informed that the audience is being shown via a 'live video link' that is projected onto a large screen with a webcam visible above it. Participants were led to believe that the webcam was showing their performance to the audience and a video camera in the corner was recording them. In reality, the live link was a pre-recorded video of the panel that ensured that each participant received identical feedback, and the webcam and video camera were turned off.

The verbal presentation task involved the child giving a speech about themselves as if they had started a new school and been asked to introduce themselves to their new class; they were told they could talk about their likes and dislikes and that they had to keep talking for six minutes. If necessary the researcher prompted with open-ended questions until the time was up (see Appendix B for prompt questions). The maths challenge was a serial subtraction task in which participants were asked to count down from 825 in multiples of three, lasting four minutes. If participants made an error they had to start again at the beginning. In a few cases the task was deemed too difficult for certain participants. If they could not give the first answer correctly after several attempts, then the starting number was decreased so the participants were able to complete the task.

The BEST-C pre-recorded video was ten minutes long and showed two children dressed in white laboratory coats (one girl and one boy, aged eight and 10 years) in addition to the adult researcher who was present in the room. A screenshot from the BEST-C video showing the child panel can be seen in Figure 4.1. The researcher and panel members were dressed in laboratory coats, in keeping with the environment and the TSST stress testing paradigm. Panel members performed the standard roles assigned in TSST tests, operationalised in the BEST-C as one member of the panel staring intently and taking notes while the other panel member played with a mobile phone, looked bored and yawned. The researcher gave neutral feedback. The video was projected onto a screen so the panel appeared life-sized and the researcher sat next to the screen to give the impression of a panel of three people.

Figure 4.1. Screen shot of the child panel in the BEST-C video.

4.4.2.3 Salivary cortisol sampling and assays

Four saliva samples were collected from participants throughout the stress test using a Salivette® (Sarstedt): a pre-stressor sample to capture a baseline cortisol level; a sample 20 minutes after the start of the stress test to assess peak response (Dieleman et al., 2010); and two samples 30 and 45 minutes after the start of the stress test to capture return to baseline (Buske-Kirschbaum et al., 1997). Participants were instructed to refrain from eating or drinking for an hour prior to providing the first saliva sample. The Salivette® includes an inner and outer plastic tube with a plastic cap. Inside the inner plastic tube is a cotton wool swab. The researcher tipped the swab from the tube into the participants' mouth (so the swab was handled as little as possible). The participant kept the swab in their mouth for a couple of minutes until it was saturated with saliva. The swab was then placed into the plastic inner tube.

Following testing, samples were refrigerated for up to three days before being centrifuged (3000 rpm for three minutes). Samples were then frozen until data collection was complete wherein they were transported on dry ice for commercial testing (Salimetrics, UK). Assays were conducted in duplicate using salivary cortisol enzyme immunoassay kits following an established and well-validated protocol with a lower limit of the assay sensitivity of 0.007 µg/dL and the mean interassay coefficient of variability of 6.3% (determined using duplicate assays of a standard solution of 100 µg/dL cortisol performed using 10 separate plates). Cortisol levels were converted from µg/dL to nmol/l in line with standard reporting values (Jessop & Turner-Cobb, 2008).

4.4.2.4 Post-test manipulation check: Brief interview

Following the relaxation period, children were interviewed using a structured interview protocol including questions about how they felt before, during and after the task, what it was like doing the tasks, what they were thinking during the tasks, how they had coped and how they felt about the 'live feed' deception. Questions are given in Table 4.1. The interview acted as an elaborated manipulation check to assess the subjective stress experience of the participant to the social stress test and their use of coping strategies. The interviews were audio recorded and transcribed.

Table 4.1

Questions used in the post-stress test interview

What was it like doing the talk?
What was it like when you had to count backwards?
Was there a difference in how you felt about the talk and how you felt about the maths?
How did the talk/counting make you feel?
What were you thinking about during the task? Were any thoughts going through your head?
You managed to complete the task even though it was hard. How did you do that?
How do you feel now that the task is over?
How do you feel about us pretending that the other children were watching you?
If another child was doing the study and was worried about it, what would you tell them?
You can say anything you like about the study (good or bad). Do you have any comments?

4.4.3 Procedure

Testing occurred in the late afternoon to account for diurnal variability in cortisol and all participants completed the questionnaires, stress test and interview in the same order. The total duration of the study was 65 minutes, although this ranged from 60 minutes to 75 minutes depending upon how long participants took to complete the

questionnaires and if they had any questions. A timeline of the procedure for this study has been provided in Figure 4.2.

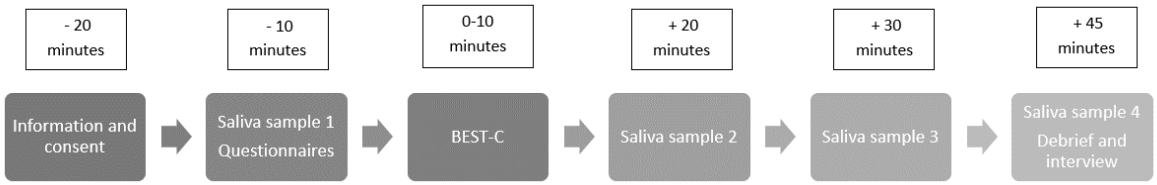


Figure 4.2. Timeline of the study protocol with the timings shown in relation to 0 (the point when the stress test began)

Before arriving at the laboratory at the University of Bath the parents of participants had been given some general information about the study by email and participants had been told not to eat, drink or brush their teeth for an hour prior to the study. In most cases each participant was accompanied by one parent on the day of testing. However, sometimes participants were accompanied by a second parents or additional siblings. Any additional adults or children were escorted to the debrief room so the procedure for each participant was the same, with only the participant and one parent present.

Parents read the information sheet while the researcher verbally explained the study to the child participants (although the exact details of the stress test were not given at this point to avoid an early anticipation effect). Verbal assent from the participant and written consent from the parent were obtained. Parent and child participants completed their respective questionnaires and height, weight, and BMI data were gathered by the researcher. Approximately 20 minutes after arriving at the laboratory, each participant provided a baseline saliva sample. On completion of the questionnaires, the researcher verbally explained the stress test in more detail, describing it as a ten minute 'speech and maths task' in front of an audience. Participants were then given five minutes to prepare some notes and ideas for the speech. Parents were able to assist participants in their preparation for a couple of minutes before being escorted to the waiting room to allow the child to spend the last three minutes preparing by themselves. The debrief room contained magazines, puzzles and colouring pens and paper for the participants as well as magazines for parents.

During the stress test the child was asked to stand in front of the researcher and the on-screen child panel. When the six minute verbal presentation and four minute maths task were complete participants were escorted to the debrief room to re-join their parent. They were informed by the researcher that the 'scary' or 'hard' part of the experiment was over and that they could now relax with the magazine and puzzles for a few minutes. Twenty minutes after the commencement of the stress test (therefore ten minutes from the end of the tasks) a second saliva sample was taken. The timing of this sample was selected because previous studies have shown that salivary cortisol in adults' peaks twenty minutes after the start of the stress test (Dieleman et al., 2010). Participants and their parent were left to relax for a further ten minutes before a third sample was taken. A final saliva sample was taken fifteen minutes later (45 minutes from the beginning of the stress test).

On completion of all samples, participants and their parent were debriefed and made aware of the deception used during the stress test. They were also given a written debrief to take away with them. Participants were then interviewed. The interviews used a structured protocol and lasted around five minutes. After the interview the participants and their parents were thanked for their participation and the participants were given a voucher.

4.4.4 Data analysis plan

Cortisol was examined across the time points using paired t-tests; the inclusion of self-reported stress grouping was examined using a split plot ANOVA. Cortisol and demographic data were analysed using a Multivariate Analysis of Covariance (MANCOVA) in which age, sex and self-reported stress group were entered as IVs, cortisol during and post-test (time two and time three) entered as DVs and baseline cortisol controlled for as a covariate. Follow-up ANOVAs and t-tests examined group effects. Relationships between the psychosocial questionnaire data were analysed using bivariate correlations and ANOVA.

The interview data was analysed quantitatively (into three stress response groups; further details are provided in the results section) and qualitatively in NVivo (version 10) using thematic analysis to identify themes and patterns within the data (Braun & Clarke, 2013). An inductive approach was taken to the thematic analysis as there have been very few studies which have used interviews to investigate children's responses to social stress tests, so a more exploratory bottom up approach was deemed appropriate.

4.5 Results

4.5.1 Coding and screening the quantitative data

Participants were given an ID number to anonymise their data. Before the data could be entered into SPSS for analysis some variables needed to be coded, specifically the Life Events Scale and the Kidcope, and some data required converting from text into numerical scores, e.g. information about parental occupation and education were converted into socioeconomic status (SES) scores. As already stated, the interviews were coded into three self-reported stress response groups.

4.5.1.1 Coding the questionnaire data

A life events score was calculated using the Holmes and Rahe (1967) weighting system which gives each questionnaire item a score based on how stressful the life events were considered to be, e.g. death of a parent is scored as 100 whereas death of close friend is scored as 63. Higher scores indicate that a participant has experienced events which are more stressful and more closely linked to illness. There is a maximum possible score (if all events listed had occurred in the past year) of 1716. Participants' scores in this sample ranged from 0 (no stress experience) to 580, with a mean score of 139.5.

Daily hassles were added up to a total score, with the higher scores representing higher levels of daily hassles in the past month and how negatively they had impacted the participant. There is a maximum possible score of 102 (34 items on the scale, each scored from zero to three). Participants' scores ranged from 3 to 81, with a mean score of 33.5.

The Kidcope comprises questions about the frequency and efficacy of 15 coping strategies. These 15 coping strategies can be grouped into 10 types of coping: distraction, social withdrawal, wishful thinking, self-criticism, blaming others, problem solving, emotional regulation, cognitive restructuring, social support, and resignation (Spirito et al., 1988). In previous research these 10 coping types have been grouped into a variety of smaller categories for ease of statistical analysis. Turner-Cobb and Steptoe (1998) conducted a factor analysis of the 10 coping strategies in a study which investigated stress, coping and upper respiratory infections (URI's). A three factor model of coping emerged which encompassed problem-focussed coping, emotion-focused coping and avoidant coping.

The present research used the three factor model of coping strategies found by Turner-Cobb and Steptoe (1998). The three factors and their ten corresponding strategies can be seen in Table 4.2. Turner-Cobb and Steptoe (1998) found that nine out of the ten

coping strategies loaded strongly on to one of the three factors, except for emotional regulation, which did not reliably load on to any of the factors. Therefore, in the present research, it was chosen to place emotional regulation into the emotion-focussed category because the Kidcope questions which relate to this strategy, e.g. 'shout, scream or get angry' and 'try to calm down', were deemed to be most relevant to the emotion-focussed category based on knowledge of the coping literature.

Table 4.2

The three factor coping model and the ten corresponding coping strategies from the Kidcope

Problem-focussed coping	**Emotion-focussed coping**	**Avoidant coping**
Problem solving	Wishful thinking	Distraction
Cognitive restructuring	Resignation	Social withdrawal
Social support	Blaming others	Self-criticism
	Emotional regulation	

A frequency score for each of the three coping types (problem-focussed, emotion-focussed, and avoidant) was calculated for each participant, along with three efficacy scores. The maximum scores were 6 for frequency and 12 for efficacy of the three strategies. Participants scores ranged from 0 to 6 for frequency, and from 0 to 7 for efficacy. Mean scores for frequency were 2.47, 3.59 and 1.81 for problem-focussed, emotion-focussed, and avoidant coping respectively. Means scores for efficacy were 3.13, 2.78 and 1.94.

4.5.1.2 Calculating socioeconomic status (SES) scores

The Hollingshead (1975) scoring system uses information about a person's sex, marital status, education and occupation to create a four factor index of social status. In single parent families the main caregiver's scores are calculated, whereas in two parent families the total score is calculated for each parent and divided by two. In the present study data was collected about the consenting parents' education and occupational level and also about the co-parent's education and occupation. Unfortunately, due to ambiguity in the question (whether it was referring to one or both parents' education) approximately

half of the data about the other parent's educational level was not completed. Additionally, data was not collected about marital status, therefore the four factor SES score could not be calculated. Nevertheless a two factor score using details of the consenting parent's education and occupation was calculated.

To create the composite two factor SES score, a score from 1 to 7 is given for educational level (ranging from less than high school to receiving a graduate degree) and a score from 1 to 9 for occupational level (ranging from unskilled labour to higher executive and major professionals). SES scores are calculated by multiplying the education score by three and the occupation score by five; three and five are the weightings given to the factors, i.e. occupation is considered more pertinent to SES than education. These two scores are then added together to get the total score.

The scoring index includes an extensive list of jobs for scoring occupations from 1 to 9. However, as the scoring system was created in the 1970's some of the job roles listed no longer exist and some modern jobs are not on the list. Therefore, when scoring modern job roles such as 'personal trainer' and 'tree surgeon' other jobs from the list of a similar status were found, such as 'health/therapy assistants' and 'recreation workers' and the scores of these comparable jobs were substituted.

4.5.1.3 Quantitatively coding the interviews

When coding the interviews using thematic analysis it was noted that there appeared to be several different patterns of response to the BEST-C amongst the participants. Therefore, the decision was made to quantitatively code the interviews into three groups based on their self-reported response to the task and to use this to inform the analysis of the cortisol data. Similar qualitative response groupings have been carried out by researchers investigating children with chronic pain who found three groups consisting of children who were adaptive, passive or stressed (Meldrum, Tsao, & Zeltzer, 2009).

Most participants in the present study reported feeling nervous before and during the task and relief once the task was over, indicating the normal pattern of response expected to a social stressor. These participants were coded as group one (normative response). Some participants claimed to feel stressed after the task had ended, during the recovery period; these participants were coded as group two (continued stress). A small sub-sample of participants did not find the task stressful at all; these were coded as group zero (no stress response).

4.5.1.4 Data screening

Data screening was carried out using standard methods outlined by Field (2009) and Tabachnick and Fidell (2007). There was no missing data in any of the key variables in the sample. Outliers were screened for using boxplots and z scores. Participant 9 was found to be an outlier for the four cortisol samples; this participant was also problematic in terms of kurtosis and skewness due to their high levels of cortisol and was therefore removed from the analysis (thus the final analysis was done using 32 rather than 33 participants). None of the other participants or variables had z scores outside the acceptable range of +/- 3.29.

Normality of the data was assessed using histograms (with normal distribution curves), mean skewness and kurtosis scores and Shapiro-Wilk tests. All skewness and kurtosis means were within -2 and +2 except for the kurtosis score for sex which was very slightly over (-2.119). The histograms looked normal except for BMI and medication; however this was not problematic for the analysis because the BMI scores were normal for children in this age range and only 18.8% of participants were taking medication which explains the skewed histogram. The Shapiro-Wilk tests showed significant results for BMI, and frequency of problem focussed and avoidant coping; again this was not believed to be problematic for the analysis as the mean scores and histograms for these variables were normal.

Linearity was assessed using scatterplots which showed oval shaped patterns within the four cortisol variables. Problems of multicollinearity were investigated by looking for correlations over 0.9, VIF values over 10 and tolerance values under 0.1. None of these were found to be over the thresholds in the main variables.

4.5.2 Quantitative findings

The means and standard deviations for the demographic and questionnaire data are shown in Table 4.3. Several of the participants in the sample were siblings (three brother-sister dyads, two sister dyads, one brother dyad and one group of three brothers) however their data and demographic information (including parental SES) were treated as separate participants.

Table 4.3

Means and standard deviations (SD in brackets) for demographic information, number of life events, daily hassles and coping strategies (n = 32)

	Boys (*n*=17)	**Girls (*n*=15)**
Age in years	8.94 (1.48)	9.33 (1.40)
Ethnicity in %:		
White British	82	80
White European	18	-
White British/American	-	7
Prefer not to state	-	13
Parent SES:		
Occupation level	35.59 (6.82)	38.33 (4.88)
Education level	19.06 (4.49)	18.80 (4.60)
Body Mass Index (BMI)	10.73 (2.84)	12.12 (3.02)
Life events score	124.53 (166.61)	156.47 (111.42)
Everyday hassles score	34.06 (20.64)	32.93 (23.05)
Use of coping style:		
Problem-focussed	2.29 (1.36)	2.67 (0.90)
Emotion-focussed	3.53 (1.38)	3.67 (1.63)
Avoidant	1.59 (0.87)	2.07 (1.16)
Efficacy of coping type:		
Problem-focussed	2.76 (2.12)	3.53 (2.13)
Emotion-focussed	3.06 (1.82)	2.47 (1.64)
Avoidant	1.65 (1.37)	2.27 (1.83)

4.5.2.1 Baseline cortisol levels

It was expected that the first sample taken 20 minutes after the participants arrived at the laboratory would reflect their baseline cortisol level. However, mean cortisol levels were found to be significantly elevated at time one compared to post-test levels for each of the five age groups, indicating an anticipation effect of the task. Anticipation effects have also been found in the published literature, evidenced by higher baseline samples of cortisol than in the recovery period (Turner-Cobb et al., 2008) and an elevated CAR the morning of an anticipated acute social stressor (Wetherell, Lovell, & Smith, 2015). This issue of high cortisol baseline measures was recently listed as one of the main challenges in laboratory-based tasks assessing salivary cortisol reactivity in children (Tolep & Dougherty, 2014). To address this issue, the fourth sample (taken 45 minutes after the beginning of the stress test) was used as a 'proxy' baseline measure (Nicolson, 2008). Baseline substitution has been carried out in other studies, most recently by Abelson et al.

(2014) who found that pre-stressor levels of ACTH and cortisol reflected an anticipation effect and so used the mean of two recovery samples (45 and 60 minutes post-stressor) as their proxy baseline measure. The remaining analyses were conducted with these three saliva time points rather than four: a proxy baseline measure, stress reactivity, and recovery. Table 4.4 displays cortisol means across the stress test.

Table 4.4

Cortisol means across the stress test

	Mean cortisol level (nmol/l)	**Standard deviation**
Time 1 (baseline)	1.19	.48
Time 2 (reactivity)	1.39	.65
Time 3 (recovery)	1.32	.64

4.5.2.2 Self-reported stress

As described earlier, participant subjective reports of their perceived stress experience before and during the task and in the recovery period were coded into three groups. When these three groupings were mapped onto the cortisol data over the stress testing period the following patterns emerged: i) participants who self-reported in the interview that they did not find the test stressful (group zero) did not show the expected increase in cortisol response to the stress test at time two (16% of the sample); ii) participants who reported that they found the task stressful but felt better straight afterwards (group one) showed the expected stress response and recovery pattern of increase post stress followed by a decrease in cortisol (56% of the sample), and iii) participants who reported feeling stressed in response to the task and that they continued to feel stressed afterwards (group two) showed an increase in cortisol post-test at time two and failed to recover as expected at time three (28% of the sample). Figure 4.3 displays the pattern of responses based on self-reported stress and cortisol data. Differences between these three groups were not significantly different across the three time points when data was analysed using a split-plot ANOVA. There was no main effect of time (p = .184) or stress group (p = .628) and no interaction between time and group (p = .697).

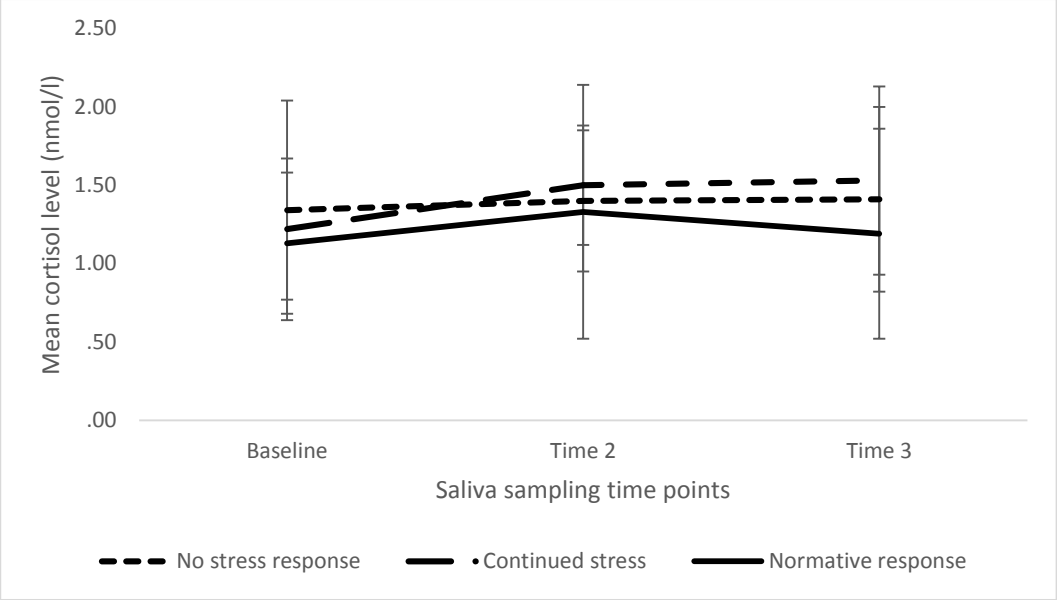


Figure 4.3. Cortisol levels (nmol/L) across the three time points split by self-reported stress response. *Note*. Error bars represent standard deviations.

4.5.2.3 Cortisol responses across the BEST-C

Figure 4.4 displays cortisol means across the stress test. Paired samples t-tests showed a significant increase in cortisol from baseline to time two, $t(31) = -2.29$, $p = .029$, but no significant difference between baseline and time three ($p = .103$) or between time two and time three ($p = .497$). This suggests that the BEST-C effectively elicits an increase in cortisol in this population. There was little difference between cortisol levels at baseline and during recovery, as expected. There was also no significant difference between the reactivity and recovery time points, explained by the age and sex differences in the recovery period (outlined below, section 4.5.2.4).

4.5.2.4 Main effects of age and sex on cortisol reactivity (time two) and recovery (time three)

The MANCOVA and follow-up ANOVAs demonstrated significant main effects for age and sex but not self-reported stress group. Using Pillai's trace, there was a significant effect of baseline at times two and three, $V = .598$, $F(2, 11) = 8.18$, $p = .007$, (with a strong effect size of $\eta^2_p = .598$). Separate univariate ANOVAs on the outcome variables revealed a significant effect of baseline at time two, $F(1, 12) = 5.86$, $p = .032$, (with a moderate effect size of $\eta^2_p = .329$) and at time three, $F(1, 12) = 15.96$, $p = .002$, (with a strong effect size of $\eta^2_p = .571$).

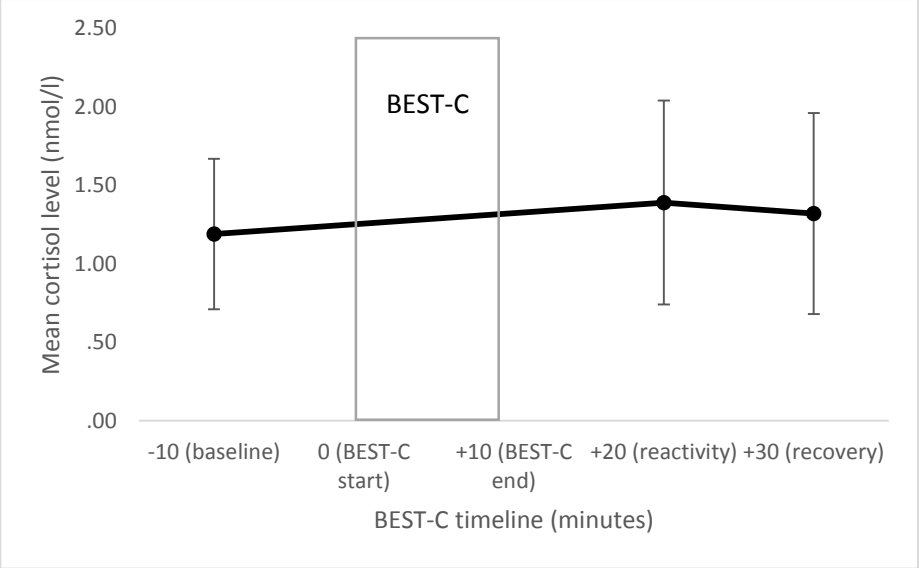


Figure 4.4. Cortisol levels (nmol/L) across the three time points (baseline, stress reactivity, and recovery). *Note*. Error bars represent standard deviations.

Using Roy's largest root, there was a significant effect of age at time two and time three, $\Theta = 1.76$, $F(4, 12) = 5.29$, $p = .011$, (with a strong effect size of $\eta^2_p = .638$). Separate univariate ANOVAs on the outcome variables revealed a significant effect of age at time three, $F(4, 12) = 4.72$, $p = .016$, (with a strong effect size of $\eta^2_p = .611$) but not at time two. A series of follow-up independent t-tests were carried out to compare age groups at time three. The only age-related difference in cortisol levels at time three was between seven and nine year olds however when a Bonferroni correction was applied to take into account the multiple t-tests carried out there were no significant differences between age groups.

Using Pillai's trace, there was a significant effect of sex at times two and three, $V = .719$, $F(2, 11) = 14.06$, $p = .001$, (with a strong effect size of $\eta^2_p = .719$). Separate univariate ANOVAs on the outcome variables revealed a significant effect of sex at time three, $F(1, 12) = 28.73$, $p = .001$, (with a strong effect size of $\eta^2_p = .705$) but not at time two. A follow-up independent samples t-test for sex found that boys had higher levels of cortisol than girls at time 3, $t(30) = 3.08$, $p = .004$. Sex differences in the stress responses pattern can be seen clearly in Figure 4.5.

4.5.2.5 Interaction effects between age and sex

Using Roy's largest root, there was a significant age and sex interaction at times two and three, $\Theta = .1.83$, $F(3, 12) = 7.33$, $p = .005$, (with a strong effect size of $\eta^2_p = .647$). Separate univariate ANOVAs on the outcome variables revealed a significant age and sex

interaction at time three, $F(3, 12) = 7.07$, $p = .005$, (with a strong effect size of $\eta^2_p = .639$) but not at time two. A follow-up independent t-test for sex (with the file split by age) found that the only age group that had a significant effect at time three was 11 year olds, $t(5) = 4.73$, $p = .005$, and that in this age group it was the boys with the higher levels of cortisol.

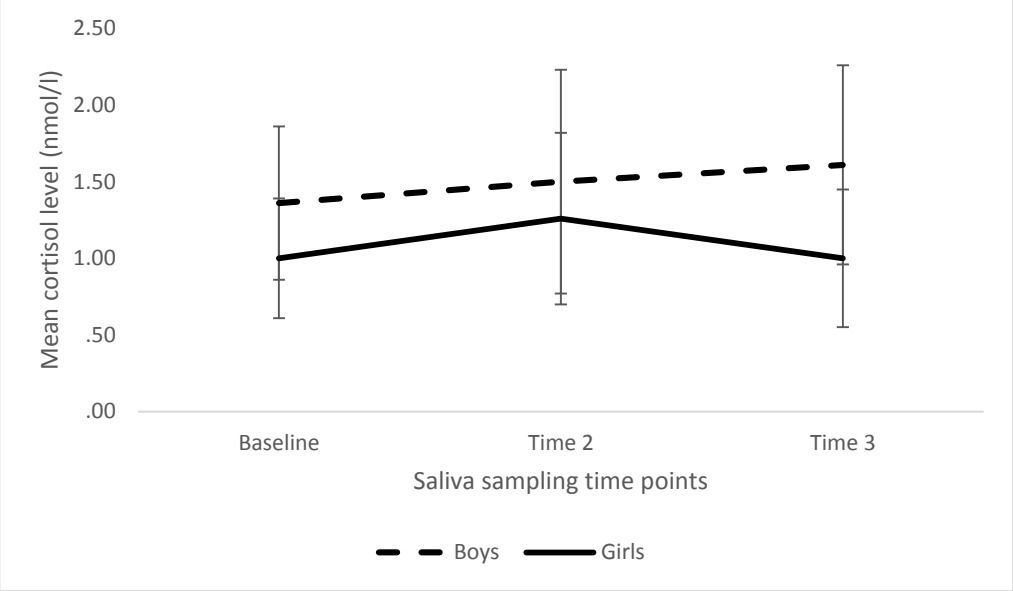


Figure 4.5. Cortisol levels (nmol/L) across the three time points split by sex. *Note*. Error bars represent standard deviations.

4.5.2.6 Analysis of questionnaire data: Life events, daily hassles and coping strategies

Bivariate correlations were conducted to examine relationships between life events, daily hassles and frequency and efficacy of the three types of coping strategies at each of the three time points. Life events (coded using the Holmes and Rahe (1967) weightings) were found to be significantly negatively correlated with cortisol levels at time two (r=-376, $p = .034$) and time three (r=-419, $p = .017$) suggesting that participants with more major life events had lower cortisol levels. Daily hassles were not found to be correlated with cortisol levels at any of the three time points. A one way ANOVA comparing the number of life events and daily hassles in each of the three self-reported stress groups was non-significant for life events ($p = .345$) and daily hassles ($p = .711$).

Correlations examining the frequency of the three coping strategies (problem-focussed, emotion-focussed, and avoidant) and cortisol levels are displayed in Table 4.5. A significant negative relationship was found between frequency of emotion-focussed coping and baseline cortisol ($r = -.367$, $p = .039$). A significant negative relationship was also

found between frequency of emotion-focussed coping and cortisol levels at time two (r = -.381, p = .031) suggesting that participants who more frequently used emotion-focussed coping strategies had lower cortisol levels at baseline and time two. A split-plot ANOVA comparing the frequency of the three coping strategies (within subjects factor) in each of the self-reported stress groups (between subjects factor) showed no significant effects between the three groups (p = .399). Similarly, there were no significant differences between the three self-report groups in relation to efficacy of the three coping strategies (p = .328).

Table 4.5

Correlations between coping and cortisol levels

	Time 1 (baseline)	**Time 2 (reactivity)**	**Time 3 (recovery)**
Frequency of coping types:			
Problem-focussed	-0.05	0.01	0.04
Emotion-focussed	-0.37*	-0.38*	-0.35
Avoidant	0.01	-0.11	-0.14
Efficacy of coping types:			
Problem-focussed	0.03	-0.15	-0.23
Emotion-focussed	0.30	0.22	0.33
Avoidant	0.07	0.05	0.13

Note. * = p<.05

4.5.3 Qualitative findings

Thus far in this chapter the interview data has been coded and analysed quantitatively in association with the cortisol data, however the discussion will now turn to a qualitative analysis of the data. The interview used a tightly structured protocol because the primary aim of the interviews was as a manipulation check therefore this does limit the depth of the analysis. However, it became clear during the interviews that not analysing the qualitative input from the children would be detrimental to the study as the participants provided details of their stress experience that were not captured by other methods.

The interview data was analysed using inductive thematic analysis (Braun & Clarke, 2013). More details on the process of thematic analysis can be found in the methodology in chapter three. Three overarching themes were found in this dataset: presence of an audience, emotions as time and task dependent, and drawing on personal

resources to aid coping. Each overarching theme included two candidate themes. In the extracts from the interviews 'I' represents the interviewer/researcher and 'C' the child participant. Where relevant the interviewer's questions were included with the children's responses. The extracts are labelled by participant, for example C1 refers to an extract from the interview with participant one. The age, sex and self-reported stress response group of each participant is shown in Table 4.6.

Table 4.6

Participant demographics in the three self-reported stress response groups. Note. Ppt no. = participant number

Normative response			**Continued stress response**			**No stress response**		
Ppt no.	Sex	Age	Ppt no.	Sex	Age	Ppt no.	Sex	Age
1	Boy	9	2	Girl	9	15	Boy	11
3	Boy	7	4	Girl	7	16	Girl	11
5	Boy	7	7	Boy	8	20	Boy	11
6	Girl	9	8	Boy	11	30	Girl	7
10	Girl	10	11	Boy	10	31	Girl	8
12	Boy	8	14	Boy	7			
13	Boy	10	21	Boy	10			
17	Girl	9	25	Girl	11			
18	Boy	7	27	Girl	9			
19	Girl	11						
22	Girl	10						
23	Boy	9						
24	Boy	8						
26	Girl	11						
28	Boy	10						
29	Girl	10						
32	Girl	8						
33	Boy	9						

4.5.3.1 Presence of an audience

4.5.3.1.1 A convincing audience

A key feature of the BEST-C that distinguishes it from other versions of the TSST is the use of a pre-recorded audience presented as a live video feed. As noted above, the interview first and foremost acted as a manipulation check therefore for the test to work the

participants must believe that the audience is genuinely watching them through a live video feed. The success of the adaptations made to the standard stress test are evidenced in the increase in cortisol in response to the stressor, and further supported by participant's comments about the stress experience.

"I: Why did you feel a bit nervous do you think?

C: Because it felt like real people were sitting in the same room" (C32)

Even though the audience were projected on a screen the set-up was convincing enough for participants to feel like the audience were physically present in the room with them. Several participants commented on how they felt nervous because they thought that the panel members seemed to be following them with their eyes (C27) or reacting to their comments during the speech task, for example *"their eyes like popped out"* when one participant was talking about a sports injury (C20).

As discussed in the findings from the quantitative coding of the interviews a small proportion of children in the sample did not find the situation stressful. These participants described the experience as *"fine"* (C21) or *"okay"* (C14) and some children thought the audience were *"funny"* rather than stress-inducing (C15). There could be numerous reasons why this sub-sample of participants did not find the task stressful, for example familiarity with such tasks, enjoying performing or perhaps they had developed effective coping strategies for dealing with social stress.

"I: So how do you feel about us having to pretend that the other children were watching you when they weren't really watching you?

C: ((laughs)) I wasn't really looking at them so I didn't really get that nervous" (C32)

In this extract the participant was able to reduce their feelings of nervousness by avoiding looking at the audience. Even though the participant was being asked how they felt about the deception their answer deals more with how they felt about the audience; this focus on the audience beyond other features of the task frequently recurred in the interviews.

4.5.3.1.2 The audience was stress-inducing

The majority of participants reported that they found the presence of the audience negative in numerous different ways, e.g. making them nervous (C18) or stressed (C10).

"C: I felt nervous when both of them looked like they were looking at me (.) that kind of freaked me out…but then sometimes they weren't very concerned…I was thinking about that the whole time…I found it a bit stressful." (C21)

For this participant it was the feeling of being watched or observed that initially disconcerted them but also the disparity of the audience's mixed behaviour of interest versus disinterest. One member of the panel stared intently and took notes whereas the other looked bored and played with a phone. This contrast of intense attention paired with indifference unsettled participants during their performance of the tasks due to prior expectations of audience feedback. In children's experiences with audiences, for example in school assemblies and gymnastic competitions (two examples given by children of situations similar to the BEST-C) the feedback from parents and teachers is resoundingly positive. Therefore, to be confronted with no positive feedback (a key feature of social stress testing) but two different forms of negative feedback must be unusual and unwelcome for young children.

A key reason why people find being observed by an audience stressful relates to SET, given that people fear negative social evaluation from others, and consequently feel nervous or worried when they think that their social self is threatened by adverse responses from others. One participant mentioned feeling *"self-conscious"* (C15) explicitly whereas others alluded to it using different language such as feeling nervous *"because I had to talk in front of people…about myself"* (C29) suggesting that it is not only the audience that makes them feel nervous but having to share personal details or stories about themselves. Many participants mentioned feeling worried about the audience and fearing looking foolish in front of them, a clear fear of negative feedback; *"I didn't want to look like an utter idiot ((laughs)) I get very embarrassed."* (C11).

Many of the participants remarked on their fear of getting an answer wrong in the maths task or saying the 'wrong' thing during the speech (C13, C20, C29, C31) particularly in relation to the audience observing any errors. Participants were told there were no right or wrong answers in the speech task, they just had to talk about themselves, but the fear of going wrong went beyond the maths task, which did have fixed answers, and seemed to affect participants' feelings towards both tasks. These feelings of fear were amplified in some participants who felt that "*you didn't know if (.) if you're going to be right or wrong (.) you knew there was no way you could be right"* (C6). This participant's response suggests that they thought the tasks were impossible or intended to trick them, a fear possibly stemming from the negative reactions being given by the panel members.

Going wrong was a main feature of participants' answers when they were asked what they were thinking about during the tasks, and this fear could have interfered with their concentration on the tasks, providing further evidence for the BEST-C in its effectiveness to induce SET.

4.5.3.2 Emotions as time and task dependent

4.5.3.2.1 Emotions were time-dependent

The majority of participants reported feeling better once the tasks were complete (as was evidenced in the quantitative results by the reduced cortisol levels in the recovery period), for example several reported feeling *"happy"* (C1, C9, C14) and *"good"* (C10). Some participants made comparisons between how they felt before or during the task and how they felt after the task was finished, for example *"a lot calmer than I was"* (C22) and several others said they felt *"relieved"* (C17, C18). However, some participants continued to feel stressed after the task; when asked if they felt better now the task was over some participants responded that they did not (C11) and some children continued to ruminate about their performance on the task: *"well I was worried that I didn't do enough"* (C26). For some participants the tasks got easier after a few minutes once they had got used to their environment (C6, C9).

> *"C: Well at first when I was just standing there…just standing there I thought 'ahh, they're watching me' ((laughs)) and so I was a little worried and then (.) then I started and it wasn't that bad"* (C31)

For this participant the audience was distracting and unnerving at first but once they got used to the task and presence of the audience they settled into it. Similar comments were made about the maths task: *"the maths isn't that bad (.) you kind of get into it. You just have to count down in three's and stuff"* (C16). Some participants got used to the task because they got into a rhythm or a pattern, for example *"once I got into the pattern it was quite easy"* (C16, also C11). These comments suggest that familiarity with a task can be comforting and aid successful coping, a topic which will be discussed further in the next section.

4.5.3.2.2 Emotions were task-dependent

When the participants were asked if they found one task to be better or worse than the other (speech versus maths task) the responses were divided. Some participants reported that they found the maths task more stressful (C3, C11, C19, C20, C21, C23,

C25), some found the speech task worse (C6, C7, C10, C15, C18, C33) and a small minority of the participants said that the tasks felt the same (C8, C22). Most of the reasons given for the maths task being worse than the speech focussed on the difficulty level (C11, C21), for example having to *"think about it more"* (C25). The task's difficulty was attributed to numerous features including having to count backwards rather than forwards (C18, C21), the starting number being quite high (C21) and it being an odd number (C25). Comments on the difficulty of the task were often accompanied with a discussion of how that made the participant feel, for example *"frustrating (.) it was quite hard"* (C23), suggesting that the difficulty and emotions about the task were intertwined. On the other hand, those who said that the speech task was more stressful tended to focus on the more personal nature of the task (C6, C10), such as feeling like they had to explain themselves (C18), although some participants mentioned difficulty in terms of it being *"hard (.) to like think of things to say"* (C23).

Some participants remarked on the novelty of the task as being a reason for its perceived difficulty, whereas children who said that they coped well with the task tended to refer to its familiarity (as mentioned briefly in the previous section). Some of the children who mentioned the novelty of the task were referring to the BEST-C set-up as a whole (C5, C6) whereas some discussed the maths task specifically (C7, also C4). Several participants likened the task to acting in plays or drama at school (C15, C25) as well as other public speaking tasks such as speaking at a friend's school (C31) and reading out work in front of the class (C8). Familiarity can indeed help children cope with situations, for example starting a new school is often very stressful but after a day or two children get used to their new environment and feel more relaxed.

4.5.3.3 Drawing on personal resources to aid coping

4.5.3.3.1 Personal characteristics

Coping strategies mentioned by participants include drawing on personal resources such as positive attributes. A wide range of personal attributes were given in response to questions about coping; these characteristics included being *"brave"* (C7), enjoying talking about oneself (C19), and an active imagination in order to help think of more topics to discuss during the speech (C17). One participant even mentioned motivation to *"try and beat"* the task (C23) which is indicative of characteristics such as competiveness and a drive to succeed. Possession of applicable skills were also mentioned as useful personal attributes, for example being good at maths (C15, C28), enjoyment of the subject, e.g. *"I*

just like counting" (C32, also C17), and also having confidence in one's skills (C7, C26). A 'just get on with it' attitude was mentioned frequently by participants and can be viewed as a display of fortitude or determination. Participants used phrases such as *"I just did it"* (C16) and *"getting it over and done with"* (C18) when they were asked how they coped with the stress test. This implies an active form of perseverance to get through the stressors they encountered.

Participants also mentioned a number of negative characteristics which they believed made them feel less positive about the tasks, such as not feeling competent at the maths task (C9, C18, C22, C24), not liking public speaking (C17, C26), and being unable to think of new ideas or running out of things to say (C11, C26). Interestingly these three negative characteristics are almost the exact inverse of the three positive characteristics given by the participants, for example in relation to ideas for the speech: *"I didn't actually know what to say"* (C26) contrasts with *"I ended up going into my imagination"* to think of ideas (C17). This suggests that these aspects are key to coping effectively (or not) with a social stressor such as the BEST-C.

4.5.3.3.2 Focus

Many participants mentioned focus during the interviews, whether that was focussing on the task itself; focussing on the audience; their notes; or thinking about things they could do after the task, this seemed to be a helpful personal resource for participants to draw upon. Some participants chose to look at the audience during the tasks as a way to help them focus on targeting their speech towards the panel, however the majority of participants were too unnerved by the audience to focus on them, and instead focussed on the task. Focussing on the task in hand was a feature of participants' thoughts, most frequently in relation to the maths task. Many participants reported *"thinking about what the next number was"* (C10, also C7, C18, C24, C26), using mathematical techniques such as *"the number square"* (C17), or counting *"in my head and count on my fingers"* (C32, also C30). For several participants focussing on the task helped them concentrate and form new ideas: *"you know, um, like when you're saying something and then you want to say more and more"* (C31). For this participant expressing one idea led to thinking of another idea which they could then discuss, creating momentum so that they could keep talking for the full six minutes.

During their preparation for the task children were encouraged to make notes of ideas of things to say during the speech and to take these notes into the stress test with

them. Some of the children found this to be helpful as the notes gave them something else to look at other than the screen showing the audience: *"I don't normally have things to look at but when I have things to look at its easier"* (C17, also C8). Other participants focussed on the time after the task when they would be free to do other things, for example participants mentioned thinking about how much time they had left to go in the ten minute task (C8), some thought about the voucher they would receive after that task (C22), and some used positive reframing e.g. *"the thought that I'd be able to stop and I wouldn't have to do it again"* (C27). Having something to focus on during a stressful task can be very beneficial, particularly something future-focussed that will act as a reward on the completion of the stressor. This focus on the post-stressor future can be seen as an example of delayed or deferred gratification; participants know that they cannot receive an instant reward because they have to complete the task, so they focus on the post-task benefits.

4.6 Discussion

4.6.1 The BEST-C as a meaningful task for inducing a stress response in children

Findings from the present study show support for the BEST-C as a meaningful social stress test appropriate for use in children aged seven to 11 years. Based on traditional stress paradigms, this adapted child stress test included a panel manipulated to directly address the participant characteristic of age. It uses a pre-recorded panel and also included a post-test interview of subjective experience. Overall, a significant increase in cortisol was observed across the whole sample 20 minutes after the commencement of the stress test. A decline in cortisol was observed post-testing, however due to sex differences during this recovery period the reduction in cortisol was not significant. Intragroup examination revealed three distinct response groupings that mapped directly onto subjective reports surrounding stress reactivity and post-task adaptation. The BEST-C was shown to elicit both a physiological (cortisol) and psychological (self-reported experience) stress response supporting its application and efficacy for use with child participants.

Results provide convincing evidence in the ongoing debate surrounding the ability of social stress tests to reliably elicit cortisol reactivity in children. Support is given to studies that report an increase in cortisol in response to a meaningful stressor in children under the age of 13 years (Buske-Kirschbaum et al., 1997; Gordis et al., 2006; Yim et al., 2010). Despite childhood being a period of relatively low cortisol compared to the post pubertal period, inability to elicit a cortisol response in previous research may have been due to the appropriateness of the test design rather than solely to the presence of this

hypocortisolaemic period. This result suggests that the combined public speaking and cognitive task were successful at inducing a cortisol response due to inclusion of stressor characteristics, uncontrollability and SET (Dickerson & Kemeny, 2004). Features of SET identified in the interviews displayed a definite fear of the child panel and reports of not wanting to "perform badly" or "look silly" in front of an audience.

4.6.2 The impact of life events, daily hassles and coping strategies

Participants reporting more stressful life events, daily hassles and less effective coping strategies were expected to be slower to recover post-task. However, individuals with experience of more stressful life events in the past year showed lower levels of cortisol at post-test (times two and three) and no significant effect of daily hassles on cortisol levels. This suggests that prior life stress may be protective of sustained reactivity to a subsequent acute social stressor. This finding is in line with work reported by Lovallo (2013) in adolescents with prior life event history. Unlike this previous work, the present findings have been interpreted more positively, as those faced with past stressful acute life events having learnt effective ways of coping, which they were able to draw on during acute social stress.

As predicted, there was a significant relationship between frequency of emotion-focussed coping strategies and cortisol levels at baseline and post stress (time two). Lower levels of cortisol at these time points were associated with more frequent use of emotion-focussed coping when dealing with past stressors. The theoretical implications of the present study extend to the transactional model of stress and coping (Lazarus & Folkman, 1984). Whilst emotion-focussed coping is often seen as having less positive outcomes (Compas et al., 2001) these results show the importance of context in defining the adaptability of the response.

4.6.3 Sex differences in the recovery period

Significant main effects and interactions occurred at time three, 30 minutes after the commencement of the stress test. The participants were relatively homogenous in their reactivity to stress as indicated by cortisol levels at time two (20 minutes after test commencement) but showed differences during the post-test recovery period. Boys revealed higher levels of cortisol than girls during recovery, suggesting that girls adapted more readily and boys continued to experience stress after the task had ended. This pattern could be explained by less frequent use of emotion-focussed strategies in boys during the

stress test, as seen in other studies (Connor-Smith et al., 2000). Other research using the TSST-C in adolescents also noted the importance of focussing on age and sex differences in the recovery period to better understand the nuances of children's stress responses (Ji, Negriff, Kim, & Susman, 2015).

4.6.4 Self-reported stress levels mapped onto cortisol data demonstrating three distinct patterns of stress response

An unexpected secondary finding in this study was that children's subjective reports of the BEST-C stress experience, as described in post-test interview, matched their cortisol response patterns. Children's descriptions of how they felt before, during and after the stress test very accurately corresponded to the objective measurement of their stress levels as assessed by salivary cortisol. It is unusual, in adult samples, for self-report to match fluctuations in biological data such as cortisol. It could be the case that children may have a more intuitive awareness of their feelings of stress, be more honest about their negative feelings and more willing to share those feelings with the researcher than adults may be. In the wider research, a study on gaze aversion in nine to 11 year olds found higher cortisol reactivity in the children who reported the task as more stressful (de Veld, Riksen-Walraven, & de Weerth, 2014b). Other work with children has found that although self-reported stress levels during the TSST were very accurate, they were much less accurate pre- and post-stressor (Hellhammer & Schubert, 2012).

That not all children had the same pattern of response and adaptation is in accord with work by Smyth et al. (1997). Of most concern are not those who responded to stress but those who failed to adapt post-task or failed to respond to the stressor. Such patterns indicate early development towards allostatic profiles that may potentially be detrimental to health if subsequently continued and reinforced (McEwen & Stellar, 1993).

4.6.5 Thematic analysis of the interviews enhanced understanding of the stress experience

Three overarching themes were found in the data: presence of an audience, emotions as time and task dependent, and drawing on personal resources to aid coping. Due to the tightly structured nature of the interview schedule the thematic analysis did not go into as much interpretative depth as would normally be the case with this type of analysis. However, this analysis did enhance our understanding of children's experience with the BEST-C. The children felt the on-screen audience was convincingly real and this was a key feature of their narratives about their experience of the BEST-C paradigm.

Children described the audience as stress-inducing suggesting that the audience stimulated feelings of SET. This adds support to the adaptations made to the standard TSST format in the present study.

The BEST-C evoked a variety of emotions in participants, and these emotions seemed to be fluid and changeable over time and between the different tasks. The majority of participants felt nervous during the task and relieved afterwards, a pattern that was reflected in the cortisol data. However, evidence purporting to the smaller sub-samples who reported continuing to feel stressed after the task and those who did not feel stressed at all was also found in the interview data. Interestingly, even the participants who said they themselves were not stressed by the tasks reported that other children might feel scared or nervous of the audience and the tasks, due to the fear of being observed and judged (evidence of SET).

Due to the quantitative findings suggesting a relationship between the use of emotion-focussed coping strategies and lower levels of cortisol it was expected that when participants discussed coping in the interviews there would be an emphasis on emotion-focussed coping however this was not the case. The main coping strategies discussed were person-centred, for example drawing on personal resources such as character attributes, to help participants cope with the stress test. Finding something to focus on such as the task itself or the time when the task would be over was a problem-focussed coping strategy that many of the participants used. The discrepancy between the questionnaire data and the interview data could be explained in terms of the type of stressor; the questionnaire data was asking participants to think about how they coped with a specific event in the past, whereas the interviews were asking participants how they dealt with an acute stressor they had experienced a few minutes before. The range of stressors chosen by participants for the Kidcope questionnaire was diverse and the events were not necessarily social stressors similar to the BEST-C. There was also a difference in timing; for the questionnaires participants were having to remember and reflect on how they felt in the past, whereas the interviews were less than half an hour after the stressor, making the memory much more current. As discussed in previous sections the context and timing of the stressor is very important in relation to which coping strategies are most effective.

4.6.6 Strengths and limitations

There are many positive aspects of the present study, such as its novel development of an adapted stress test in which the panel rather than the participant or task was

manipulated. The use of a pre-recorded audience proved to be a successful adaptation for children, as in research with adolescents (van den Bos et al., 2014; Westenberg et al., 2009). The current study was conducted in an experimental setting and a mixed methods approach was taken which provided a more complete picture of the impact of social stress testing. The interviews provided much more than the expected manipulation check; they gave a detailed and unique view of participants' experience of the stress test, a topic which has not been examined using interviews before.

However, there are a number of limitations. Firstly, the small sample size. Although a power calculation determined 32 participants to be appropriate and a similar sample size (31 participants) has been found in other published studies examining responses to stress testing in adults (Tyrka et al., 2007), a larger sample would have enabled more confidence in the generalizability of the findings. Issues of protocol relating to the baseline measure provided another limitation. Whilst stress testing protocol recommendations were followed, taking the initial baseline sample 20 minutes after the participant arrived at the laboratory to enable time to adapt to the novel environment and researcher (Gunnar, Talge, et al., 2009), this was not sufficient to obtain a baseline assessment.

Children showed a higher than expected response at 20 minutes after arrival, despite efforts to minimise this novelty effect, and we captured an anticipation period rather than a baseline assessment. Stress anticipation could have been due to a number of factors, including uncertainty or worry about the research, nervousness about going to a new place and meeting a stranger, or to events outside of the laboratory including a stressful journey and difficulty finding the laboratory. Research has highlighted the importance of pre-stress test cortisol levels as arrival stress has been found to correlate with children's stress reactivity (de Veld, Riksen-Walraven, & de Weerth, 2014a).

The present study addressed the issue of a high baseline sample by using the fourth sample taken at 45 minutes after the onset of the stressor as this represented the recovered cortisol state post-testing and hence provided a useful proxy measure of baseline cortisol. We would draw attention to the need for sufficient laboratory time prior to baseline assessment to obtain a true baseline and the particular relevance of this in child stress testing. Some researchers have obtained a baseline away from the laboratory in the child's naturalistic environment a day or more prior to the laboratory stress test (Hostinar et al., 2015b; Lovallo, Farag, & Vincent, 2010). In future work this approach would be endorsed

in order to minimise time required in the laboratory and to obtain a truer baseline uncontaminated by anticipatory stress effects (see chapter six).

4.6.7 Conclusions

The present study has confirmed the effectiveness of the BEST-C as a social stressor for children aged seven to 11 years. Sex differences found in the recovery period suggest heterogeneity in recovery times after a stressor. Findings relating to coping strategies highlight emotion-focussed coping as a useful strategy under acute social stress. The BEST-C also used an innovative mixed methods approach including an interview of subjective experience that was coded numerically and analysed in conjunction with the cortisol data. This demonstrated that children were accurate in their assessments of their feelings towards stress as their responses matched their biological response to stress. This secondary finding provides convincing support for some of the key stress and coping theories. The BEST-C is the first stress test to use children of the target age group of seven to 11 years on the stress panel in conjunction with a pre-recorded video presented to participants as a live feed to ensure consistency of panel response. It offers a meaningful acute stress paradigm with potential applications to other child and adolescent age groups for investigating relationships between stress, coping and health outcomes.

Chapter five: Study two

5.1 Chapter overview

This chapter summarises the qualitative findings from a mixed methods study investigating children's experiences of stress and illness, and the coping strategies they use to deal with stress. This study is the first in a two-part study using the same group of participants to explore broader experiences of stress and coping using in-depth interviews (study two) and acute stress responses to a laboratory social stressor (study three).

Thirty-eight children completed questionnaires (with the assistance of a parent if required) about stressful life events, daily hassles, coping, illness and early life stress. The questionnaire responses were used to guide the interview protocol during semi-structured interviews with the participants about these topics. The interviews were analysed using inductive thematic analysis which generated four themes: navigating the social minefield, pressure to thrive in the modern world, fear of the unknown and learning life's lessons.

The findings from the present study suggest that social relationships make up a considerable proportion of the early life stress and adversity experienced by young children, particularly in relation to managing friendship dynamics and enduring bullying. Social support was a key coping strategy, along with a range of other emotion-focussed, problem-focused and avoidant coping strategies, which suggested that both coping and perceived stress were context-dependent. Children encountered pressure to do well from numerous sources which could impact positively or negatively on their self-esteem depending on how well they coped. Unknown stressors were reported as being difficult to cope with, and coping was reported to be more successful when dealing with familiar rather than novel events. The importance of learning from stressful events and learning how to cope were mentioned by children and their parents.

5.2 Introduction

5.2.1 The use of qualitative methods in stress research with children

Early life adversity and stress can have an impact on physical and mental health over the life course, therefore it is imperative to study stress and coping in childhood. The majority of stress and coping research carried out with children uses quantitative measures such as questionnaires, for example the Life Events Scale (Holmes & Rahe, 1967), the Children's Hassles Scale (Kanner et al., 1987), the Perceived Stress Scale (Cohen et al., 1983) and the Kidcope (Spirito et al., 1988). These are all well-established measures of

stress and coping (three of which are used in the present programme of research) however they do not enable the researcher to follow-up on any of the answers or delve into more detail. For example, the life events scale can tell us what stressors children have encountered over the last year but does not tell us the extent to which these stressors impacted the child and in what ways they were affected. Therefore, there is a need for qualitative data collection of these topics.

As discussed in detail in the methodology in chapter three several interview protocols have been developed to investigate stress in child and adolescent populations. Three main issues were outlined with the interview protocols available: the focus of most of these interviews was on mental rather than physical health, the use of parents as proxy respondents rather than interviewing children, and when children were interviewed it was done separately to their parents. Some protocols were outlined that did address topics such as physical health, early life experiences and coping strategies, however none of them fully captured the intentions of the present study. Therefore, to address the first issue, the present research intended to develop a new interview protocol about stress, coping and illness for use with young children. It also aimed to interview child-parent dyads so that the perspectives of both child and parent could be gathered and analysed, thereby avoiding the pitfalls of issues two and three, and enabling child and parent input to complement and build on one another.

5.2.2 Contextualising the present study within the broader research programme

Study two builds upon the findings of study one, and was conducted concurrently with study three, to provide a holistic view of children's experiences of stress. This embedded and multiphase research design enabled the researchers to further investigate the psychosocial factors involved in stress resilience (e.g. coping, social support and individual differences) using in-depth interviews. As discussed in chapter four, study one highlighted the importance of gathering children's views about their experience of stressful events, as their self-reported feelings of stress matched accurately to their cortisol levels (an objective measure of stress). This apparently innate ability to precisely comment on perceived stress before, during and after the stressor, that children demonstrated in study one, is not often found in adults. Therefore, it is important to gather data directly from children rather than relying on parental informants alone.

The rationale for interviewing child-parent dyads emerged from both the wider literature (as evidenced in chapter three) and from the findings of study one, in which the

most illuminating information about children's stress experiences was gathered when the dyad interacted in the post-stressor interview. For example, parents were good at prompting children's memories for specific events, and children were good at describing how they felt about those events. This rich data would not have been found if either of the dyad were not present and this interaction is known in the literature as story scaffolding (Irwin & Johnson, 2005). Although the brief interviews yielded a wealth of data regarding how children felt about stressful events and how they coped with them, these interviews were not extensive enough to fully investigate these topics or allow for an in-depth analytical interpretation, therefore the present study aims to investigate these topics in more depth.

5.2.3 Aims of the research

This two-part study aims to investigate the topics of early life stress and adversity, coping and illness in a sample of children and their parents, with the intention of better understanding the psychosocial factors and individual differences that characterise the development of stress resilience and stress vulnerability in children.

The present study (study two) used a series of questionnaires to gather data about stress, coping and illness. Questionnaire responses were then used to guide a semi-structured interview with child-parent dyads which allowed for an in-depth discussion of the relevant topics. The second part of the two-part study (study three) will be discussed in detail in the next chapter, but it is pertinent for clarity to mention here that study three drew from the same group of participants as the present study.

The interview data will be presented in the current chapter. The questionnaire data from the present study will be described and analysed in chapter six in correspondence with the cortisol data collected in study three. The qualitative data from the present study will also be used to inform the allocation of participants to four stress-resilience groups used as a variable in the study three analysis (this will be discussed further in chapter six).

5.3 Method

5.3.1 Participants and recruitment

This study, as phase one of a two-part study along with study three, was granted ethical approval from the Department of Psychology ethics committee on 12th May 2014 (ethics references number: 14-118). Participants were recruited for a two-part study although consent was taken separately for each phase so participants were able to just

complete part one (the present study) if they preferred. However, the majority of participants from this study (89%) did take part in study three.

Participants were recruited using an opt-in recruitment method with a variety of recruitment strategies. A press release aimed at parents and their children inviting them to take part in interviews about 'how children cope with challenges' was placed on the university website and sent to several local newspapers. Schools in the local area who had expressed an interest in taking part in research were contacted by the university's public engagement office. The study was advertised on relevant websites (e.g. mums net, gumtree) and using social media such as Twitter and Facebook. Posters were displayed at the university campus and emails were sent to humanities and social sciences faculty staff and students, and to parents of children who attended sports lessons (e.g. swimming and tennis) at the university sports centre. The researcher also emailed parents whose children had previously expressed an interest in study one but had been unable to participate due to timing. The email to local sports clubs was the most successful recruitment method (drawing 18 participants), followed by word of mouth (five participants), school newsletters (four participants), university website (four participants), emails to parents who had expressed an interest in study one (four participants), and newspaper advertisements (two participants).

Any parents with children in the appropriate age range (seven to 11 years old) who responded to an advert were included in the sample with the exception of those with an ongoing mental or physical illness. These individuals were excluded from participation if, for example, they had a child and adolescent mental health services (CAMHS) referral, special educational needs (SEN), or were taking oral steroid medication (the latter could impact the cortisol data collected in study three). For practical reasons the participants had to be from the local area as, although the interviews (study two) could be conducted either at the university or at the participant's homes, study three required participants to complete the stress test in the lab at the university.

Thirty-eight children aged seven to 11 years, each accompanied by one parent, took part in the interviews. Therefore, there were 76 participants in total (38 child-parent dyads). There were 16 girls and 22 boys in the sample, and almost all of the participants were interviewed with their mothers, with the exception of four participants who were interviewed with their fathers. Age and gender details are given in Table 5.1, and further demographic details can be found in chapter six. This sample size was required because the participants taking part in the interviews in the present study also took part in the

experimental lab task in study three which was analysed statistically. Study three therefore required a sample size of over 32 (according to the G*power calculation outlined in chapter four) in order to have enough power to detect the impact of the BEST-C on cortisol levels using MANOVA. More than 32 participants were recruited for the present study to allow for participant attrition, which is known to occur between studies in multi-phase research. This sample size was also selected based on recommendations from researchers who conducted over 60 interviews and found that 12 interviews were the maximum required for theme saturation (Guest, Bunce, & Johnson, 2006).

Table 5.1

Participant demographics

	Boys	**Girls**
7 years	C12, C16, C32, C34	C14, C22, C33
8 years	C17, C26, C30	C2, C7, C20, C27, C29
9 years	C19, C31, C37	C5, C15, C24, C36, C38
10 years	C9, C10, C11, C21, C25	C23
11 years	C3, C4, C6, C8, C13, C28, C35	C1, C18

5.3.2 Measures

5.3.2.1 Questionnaires: Demographics, life events, daily hassles and coping strategies

Participants were given a booklet containing five questionnaires for them to work through with the help of a parent (if required) collecting data about: demographics, life events, daily hassles, coping strategies and health. The first four questionnaires were the same measures used in study one and have been described in detail in chapter four. The only change to these questionnaires was the addition of parental marital status to the demographic questionnaire.

The fifth questionnaire was introduced in the present study to collect health data and was modified specifically for this study from the health questionnaires used in the Avon Longitudinal Study of Parents and Children (ALSPAC) (see Appendix C). However, the data from this questionnaire was not analysed in the current programme of research as the questionnaires and interviews yielded so much rich data that there was only space to focus on the stress and coping data. The relationship between stress, coping and health will be addressed in future research outside of this thesis.

Two scales were also developed for use during the interviews to help break up the question-answer format; these scales included four questions about personality and seven questions about health and illness (see Appendix D and E). Examples from the personality scale include 'How sociable is your child?' and 'How does your child respond to stressful events?', and examples from the illness scale related to a specific past illness and asked about its impact, seriousness, duration, onset, controllability, predictability, and demand on resources. Questions from both scales were based on questions from the ALSPAC research (as mentioned above) and were rated on a six point Likert scale (with descriptions at each point on the scale). Again there was not space to fully analyse this data, however as described in the methodology chapter, breaking up the interview by using other data collection methods is a technique used to make the interview process more accessible for young children (London School of Economics, 2010; Shaw et al., 2011).

5.3.2.2 Interview protocol

The interview was semi-structured and used an interview protocol which followed on from the topics covered in the questionnaires, e.g. stressful life events, coping, illness and early life adversity. For example, the researcher would choose a life event or daily hassle that the participant had mentioned on the questionnaire and ask them questions about it, such as 'Could you describe what happened?' and 'How did that make you feel?'. The interview protocol was developed and refined with a qualitative colleague and based on the research and recommendations (outlined in the following sections) of qualitative researchers who work with young children. A full list of interview questions can be found in Appendix F. Although the interviews had some preordained questions and topics, time was also given for participants to discuss any topics or events they felt to be significant or relevant so the interview was, in part, led by issues of importance to them. The interview was recorded using an audio recorder and a notebook.

Some adaptations were made to the standard interview format of question and answer to make the interview process less fatiguing for children, for example the use of open and closed questions. These changes were made based on recommendations from researchers conducting interviews with young children (London School of Economics, 2010; Shaw et al., 2011). Five prompt cards, each with a different topic label corresponding to the five topics (listed above), were placed on the table during the interview. This enabled participants to know which topic area the questions were about and gave them some indication of how far through the interview they were, e.g. if the third card

was on display then they would know they were two topics away from the end. This was suggested by researchers in a best practice guide as a way to divide up the interview into manageable sections and keep young children's concentration throughout the tasks (London School of Economics, 2010).

5.3.3 Procedure

Participants were given the option of being interviewed at home or in a meeting room at the university. An information sheet was given to the parent to read while the study was explained verbally to the child. Parents completed a written consent form and children were asked for their verbal assent. It was explained to participants that the researchers were interested in their experiences of and feelings about positive and negative life events and that there were no right or wrong answers.

The child-parent dyads completed the questionnaire pack together. Once the questionnaires were complete the researcher turned on the audio recorder and began the interview using the interview protocol and questionnaire responses as guidance. The interview began with questions about the child (their hobbies, their family etc.) to establish rapport and ease the child into the interview. At first participants were often nervous of speaking until they got used to being recorded and answering questions. This section ended with the participants completing a personality scale (with parental assistance if required).

The interview then moved on to cover topics mentioned on the stressful life events and daily hassles questionnaires. Participants were asked questions which focussed on describing the event, how they felt about it, and comparing their feelings and relationships before and after the event. Once participants had been given the opportunity to raise any other relevant or important events that were not covered by the questionnaires, the questions moved on to the topic of coping. The researcher looked at the coping strategies participants had highlighted in the questionnaire and asked questions relating to whether they used these coping strategies for other problems and what their usual coping responses were. Participants then completed a second scale (about illness) to break up the questioning and answered verbal questions about their experiences of illness and how they generally coped with illness. For the last topic of the interview parents were asked about whether any stressful or challenging events happened while the mother was pregnant with the child and in the first year of the child's life.

The interviews lasted between 20 and 55 minutes (with an average length of 28.5 minutes). After the interviews there was usually a discussion of how the participants felt

about the interview and their interest in the research area and its applications (equivalent to debriefing). Children and their parents were verbally thanked for their participation in the first phase of the two-part study. If they were still happy to take part in the second phase of the study (study three) a date and time were scheduled for them to come to the lab.

5.3.4 Data analysis plan

The questionnaire data collected in this study will be reported in chapter six along with the cortisol and heart rate data collected in study three, in order to examine the relationships between psychosocial factors and physiological stress data. In this chapter the questionnaires have served only to direct the interviews.

All child, parent and researcher comments were transcribed. In some of the interviews, remarks were made by siblings or the other parent when they passed through the room where the interview was taking place (this occurred when the interview location was the participants home rather than when they came to the university to be interviewed). This data has also been transcribed and coded.

The interviews were analysed using an inductive approach to thematic analysis which involves seven steps: transcription, reading and familiarisation, complete coding across the dataset, searching for themes, reviewing themes, defining and naming themes, and writing up the analysis (Braun & Clarke, 2006). More details on the process of thematic analysis can be found in the methodology in chapter three. Analysis was carried out using NVivo (version 10) which allowed the researcher to code sections of the transcripts, group codes together, and view the data either by transcript or by code. An example of coding using NVivo is shown in Figure 5.1.

5.4 Results

5.4.1 Quality criteria

In the previous chapter the results section included a section about the assumptions of quantitative data and how they were met in study one (i.e. data screening). Although it is not appropriate to apply the same reliability and validity criteria used in quantitative research to qualitative research there are alternative methods of evaluating quality. Silverman (2013) suggests that several strategies can be used to ensure quality in one's data, methods and findings, such as methods being grounded in theory, triangulation with other data, and member validation (Silverman, 2013). Other researchers suggest similar quality checks in terms of member checking and triangulation, as well as discussions of

inter-rater reliability and transferability of findings (the qualitative equivalent to generalisability of findings) (Braun & Clarke, 2013).

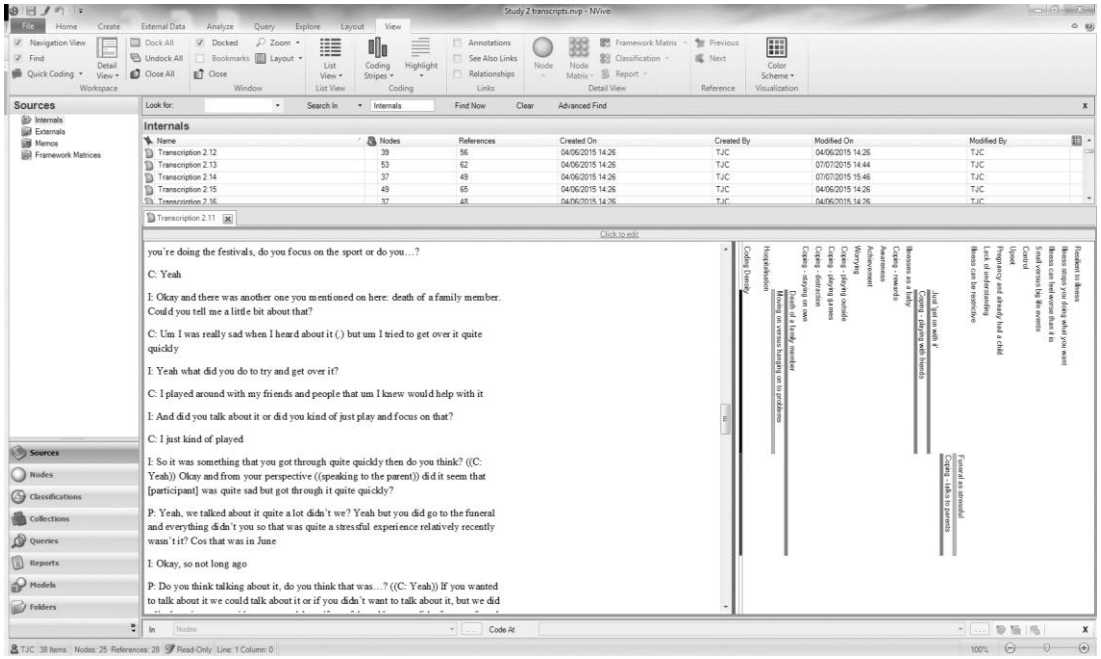


Figure 5.1. Screenshot from NVivo (version 10) showing the transcript of an interview on the left with coloured coding stripes (shown here in greyscale) on the right

In the present study a number of the quality criteria discussed above were used to ensure the credibility of the research. The research was conducted from a pragmatic standpoint therefore the methods and data were embedded within a pragmatic theoretical foundation. The qualitative data from the present study will be quantitatively coded in the next chapter to create four stress-resilience groups that will be analysed in association with the physiological and questionnaire data. This is a form of data triangulation that will ensure a fuller picture of children's experiences of stress is gathered. To ensure robustness in the researcher's interpretation of the data a proportion of the interviews were examined by qualitative colleagues (HF and TH). Six transcripts chosen at random (15% of the sample) were allocated to HF and TH who coded them independently. The researcher met with each coder and went through all of the codes, created by both researcher and coder, in each transcript. There was a high level of agreement between the coders and the researcher, and when codes appeared in one person's transcript but not in the other they were discussed and a decision made about their inclusion. Using this method of code checking with the two independent coders, all original codes were agreed upon, the wording of five codes was improved upon, and five new codes were included in the analysis.

5.4.2 Overarching themes and candidate themes

Four overarching themes were found in the data: navigating the social minefield, pressure to thrive in the modern world, fear of the unknown and learning life's lessons. The first two themes reflect broader social elements of participants' lives whereas the latter two represent more individual features. The definitions, relationships to key topics and examples from the data can be found in Table 5.2. Each overarching theme encompasses a number of candidate themes (displayed in Figure 5.2). In the next section, a brief introduction will be given for each of the overarching themes and a detailed discussion, with supporting extracts from the data, will be provided for each candidate theme.

5.4.2.1 Navigating the social minefield

For many children in this study, their social world, which was made up of friends, family, and teachers, was a difficult area of their lives to navigate. Managing the dynamic relationships with people was an important skill for children to learn, especially as their relationships changed over time and relationships with friends were often far from smooth. Due to the fluidity of these relationships over time the social world was one of the main sources of stress and adversity for children in this study. As well as the complexity of children's friendship dynamics, the candidate themes in this section include a discussion of bullying, particularly in relation to the feelings of exclusion and isolation that stem from bullying, and the potential reasons for its occurrence. The final candidate theme addresses the use of social support as an effective coping strategy which focuses on the importance of sharing one's burden, seeking and receiving reassurance from others.

5.4.2.1.1 Complex friendship dynamics

The dynamic nature of children's friendships was evident in how children spoke about their friends e.g., *"sometimes he annoys me but some (.) sometimes he's also my friend"* (C10). Falling out was seen as a normal part of friendship, which was fluid, often changing overnight.

> *"C: (.) Well one day my friend* [Friend 1] *is my best friend and then the other day she's like (.) not really my best friend at all"* (C12)

C12's parent noted that this was an intrinsic feature of their friendship and had been present throughout their entire relationship. These fallings out were not taken lightly, in fact they were taken very seriously and were referred to as *"break ups"* by several participants (C7, C23).

Table 5.2

The four overarching themes with their definitions, relationships to key topics and examples from the data

Theme	**Definition**	**Relationship to key topics of stress/adversity, coping, and resilience**	**Data segment**
Navigating the social minefield	Children's social worlds are made up of frequently changing dynamic relationships with friends, families and teachers which they need to find ways of managing.	Social *stress* is a key feature of this theme as much of the stress children encounter is due to these social connections. *Coping* is also a large part of this theme as children learn ways to cope with the changing dynamics of their social world. Social support is a significant coping mechanism.	*"C: Um (.) sometimes when he's playing a game and (.) I want to play with him he always says (.) something like 'no, I want to play alone' and I get quite annoyed about that and then sometimes (.) I'm playing a game and say 'do you want to play?' and he says no (.) so it gets a bit hard sometimes"* (C5)
Pressure to thrive in the modern world	Modern childhood is made up of many different sources of pressure, whether they are school-related or extra-curricular,	Pressure to perform well is a strong feature of the *stress* experiences of children.	*"When you were doing the biathlon that you really didn't want to do because you felt you weren't good enough (.) you told*

	and implemented by children themselves or the expectations of others.	Pressure to thrive can be linked to self-esteem which in turn has been associated with *coping* and *resilience*.	*me to ask the teacher to make you not do it didn't you?...You had a pushy mummy who told you you should do it since you'd been picked"* (P15)
Fear of the unknown	Not knowing what the future holds or how a situation is going to end can lead to worry and rumination, particularly if the event or situation is uncontrollable.	Uncontrollable or unknown situations can lead to *stress*. The ability to *cope* with such stressors is important for dealing with future stressors and developing *resilience*.	*"If something unexpected happens that doesn't go the way you think it'll go you can get, you get quite cross sometimes don't you"* (P20)
Learning life's lessons	Life, especially during childhood when so much is novel, can be seen as an opportunity to learn.	Learning how to *cope* effectively is a big part of life's lessons. Learning from stressful experiences also helps prepare people for future *stress* and increase *resilience*.	*"*[Participant] *copes remarkably well with big things but will get upset about little things"* (P2).

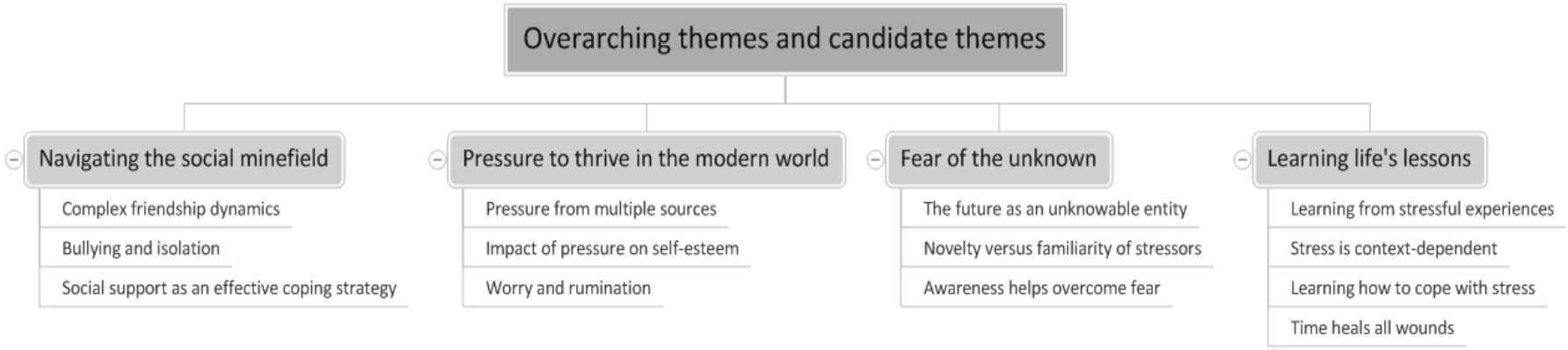


Figure 5.2. Thematic map displaying the relationship between the four overarching themes and their corresponding candidate themes

There are many reasons why children fall out with one another, however the narratives of this sample population mostly related to a friend doing something wrong which annoyed, angered or upset the participant (C5, C10, C22, C26, C27, C29). The participants themselves were hardly ever to blame, according to their own accounts. In these children's narratives, friendships were restored after children talked through their problems (C20), parents or teachers intervened (C22, C29, C30, C35), or when one child forgot about the falling out (C38). If participants *"couldn't solve it"* then this was when the friendship fell apart or, in some cases, turned into an adversarial relationship (C5, C28).

Distinctions were made between best friends and ordinary friends, *"I'm fine with her (.) but then (.) it's just that she wasn't my bestest bestest friend"* (C23). There seemed to be a need to categorise friends based on closeness in a personal social ranking or hierarchy. Fallings out were particularly frequent when a best friend did something to upset a participant, especially when the friend's actions suggested they did not value their place in the social ranking, for example:

> *"C: One of my worst enemies (.) my friend has made friends with him so (.) it's quite hard to like (.) be friends with him anymore"* (C26)

Issues such as this could drive a wedge between friends and alter their level in the social ranking. Regular friends and best friends were not the only categories children used to divide up their social world; enemies was a term used widely by participants. Enemies could be bullies, ex-friends or just people children did not like. Sometimes enemies were defined by fear, i.e. if you were scared of someone they were your *"worst enemy"* (C26, also C28).

5.4.2.1.2 Bullying and isolation

As well as changeable friendships, many children experienced more complex social dynamics in the form of bullying. For some participants there was a fine line between teasing and bullying. Falling out with a friend because they said something mean could be considered to be bullying in certain contexts. Usually if the person was their friend again the behaviour was categorised as teasing but if they were still fallen out it was deemed to be bullying (C1, C2, C8, C34, C38).

However, for other participants bullying was more severe than falling out with friends, with some incidences being so serious that children had moved schools (C2, C6, C28). Children reported that bullying made them so worried they could not eat or sleep (C1) and wanted to avoid school, to the extent that they would feign illness or run away from school (C2, C6, C28). Often bullying led to feelings of exclusion and isolation (C6, C12, C23, C28, C31, C35).

> *"I haven't seen them say it to any other boy (.) they all gang up on one person (.) and they like pick the person they don't know or don't like the look of"* (C28).

However, the mother of this participant noted that other children might be being bullied as well but her son might not notice it because he was quite self-conscious, and therefore only noticed when it was happening to him. This could be linked to his expectations, a possible psychological consequence of the bullying; the child felt *"hated"* (C28) by the boys in his class and was very affected by their bullying behaviour however this self-focus may lead to him only noticing times when he was bullied (in accordance with his expectations) and not when other children were bullied (a violation of his expectations).

Participants believed they were bullied for several reasons, often because the bullies were trying to hide their own failings (C36), or, as participant C28 discussed above, it can happen because someone is different. For example, one participant felt his bullying was caused by his perceived social standing, and that when he moved schools he felt a change in his social status, *"a definite elevation (.) I'm not sure how to um (.) describe it but um ((pause)) I was respected more um (.) I was treated like a person"* (C6). Social hierarchies with different levels of social status could contribute to some of the social issues children experience at school, as discussed in the previous section. For most of the children, moving schools drastically helped them feel better (C2, C6), however sometimes the bullying continued at their new school (C28). This was due to a combination of the children attending the school and the school itself. Some schools dealt very well with bullying and others did not; some of the schools went as far as to blame the children being bullied rather than admit that bullying was an institutional problem (C2, C6). Therefore, the way teachers, and schools as a whole, respond to bullying is key, in terms of improving outcomes for the bullied child, and also demonstrating to bullies the consequences of their actions.

Bullying took several forms, including physical and verbal harassment; for one participant it took the form of mean comments and disrespectful behaviour, *"she would*

also back-chat you and be horrible about people" (C1). For other children it was destruction of their property, *"it's like* [participant] *had this thing that he thought was cool (.) so they wanted to destroy it"* (P6) as well as physical fighting and violence (P28). Some of these different forms are evidenced in the following extract.

> *"P: Your use of the term 'beat me up' also means speaking badly at you doesn't it (.) it doesn't mean (.) it's not only a physical activity (.) or they look at you in a certain way means 'beat you up' (.) so it can mean lots of things this phrase*
> *C: And they like talk about me when I'm not like (.) 'oh yeah* [participant]*'s a horrible person don't go and play with him' (.) just behind my back when I'm not there"* (C28 and P28)

The use of language to describe the bullying in this discussion between parent and child was fascinating as it highlighted how the words and phrases children use to describe their experiences of stress can have different meanings from the normative meanings used in adult language.

5.4.2.1.3 Social support as an effective coping strategy

Over half of the participants mentioned using social support to help them cope with problems. Other coping strategies will be discussed in the life lessons theme but coping strategies related to social relationships will be focussed on in this section. Many children utilised social support by talking to their parents (C1, C7) and friends (C1) about their problems. This social support was not merely one-way, as several participants discussed reciprocal coping. For example, talking to their friends about problems was comforting to them and their friends were able to share problems in return (C10, C20, C21). However, not everyone found social support to be a useful strategy; some participants did not find talking about their problems helpful (C15, C19, C24, C25) and some did not want their parents to get involved in their problems (C8, C13, C23).

The participants who did find social support to be a helpful coping strategy noted that when they shared their problems by talking to parents, siblings, friends or teachers it was not just the act of telling them the problems, but also feeling listened to and understood, that helped them cope (C1).

> *"P: I think talking to me is good isn't it? ((C: Yes)) It helps to reassure us and also if you feel that you've actually been understood that helps, because sometimes maybe I don't listen enough do you think? ((C: Yeah)) cos I'm a bit distracted so if I listen and understand why you're worried then it helps"* (P38)

When parents did not display enough attention to children's problems, this interfered with the child's ability to cope, *"sometimes when I tell you about something and you don't listen I get really upset"* (C38). Listening, understanding and receiving reassurance were important for children and this reassurance came in many forms, such as through verbal encouragement from parents. Children wanted to be reassured that things would be ok (C38) and that when bad things happened *"it's not the end of the world"* (C17, also C37). Children looked to their parents to bring them back to reality when their worries got too much for them.

> *"P: She just didn't want to do something because she was afraid she would fail, I can't remember what it was actually and I just went 'oh and if you fail what happens?' and she said 'nothing' and 'will you feel different about yourself', 'no' so kind of her head goes all over the place until someone brings her back to the basics ((pause)) until someone really points out that actually if you think about things in a different way and it's not at all that terrible, she needs to be ((whistles)) brought back to focus"* (P14)

This extract provides an example of the parent applying cognitive restructuring in getting the child to think about their problems in context along with possible outcomes, and can be helpful for reducing feelings of stress. Other parents used similar techniques to reduce children's worries about forgetting their homework (P36).

Reassurance was gained not only through talking, but also through physical closeness; for some participants merely being in the presence of their social companions was comforting (C16) and playing with friends helped distract them (C11, C32). Hugging was something that many children found very comforting, whether it was hugging their parents, friends, pets or hugging favourite toys (C15, C17, C20, C26, C31).

> *"P: Actually losing the dog was a big thing, it was ((pause)) I think when the kids were sad they'd all go and cuddle her (.) yeah so they lost that"* (P17)

Hugging was a source of physical comfort that helped these children cope and so when their dog died they lost something that was a source of comfort to them, at a time when they most needed comforting.

5.4.2.2 Pressure to thrive in the modern world

The children in the present study experienced demands from multiple sources. Children experienced pressure to do well at school, as well as performing extra-curricular activities to a high standard, and increasing levels of responsibility for their own health.

The pressure to thrive in all of these areas is placed on children both by themselves (internal sources of pressure) and by those around them such as parents and teachers (external sources of pressure). This pressure to thrive was shown to have both positive and negative effects on children's psychological wellbeing. Positive effects included increased motivation and feelings of self-worth, however too much pressure could also negatively impact self-worth and self-esteem. Similarly worry and rumination were a large part of children's narratives, as not succeeding at a task could lead to intense rumination on past and future stressors.

5.4.2.2.1 Pressure from multiple sources

Pressure to do well comes, not only from school, but from other areas of children's lives such as extra-curricular activities and a growing responsibility for their own health. That is not to say that school comes without its own unique set of stressors, such as struggling with schoolwork (C15, C17, C23, C31), tests and exams (C4, C21, C36), and difficult homework (C21, C25, C29, C34). Exams were listed as a particularly stressful aspect of school, especially those in the final year of junior school (year six).

> *"C: Ever since year five almost the school's been preparing us for an exam to go to the same school, just into the senior school so um and then it all came down to this one day almost. It was a lot of pressure and it was quite stressful because we did lots of um mock exams and we do like extra exams anyway"* (C36)

For this participant the stress of the exams came from wanting to do well but they also felt some pressure from the school, as there was such a big build-up to the exams (with lots of mock tests) and the pressure to get into high school. This combined pressure from self and others contributed to what was already a stressful event. Parental pressure also played a role in children's narratives. For C15 parental pressure convinced the child to take part in a sporting event when they originally did not want to, however they felt a sense of achievement afterwards, the knowledge of which will contribute to how they cope with future stressors.

Examples of sources of pressure that were external to schoolwork include rehearsals for a play (C1), gymnastics competitions (C16), and a role on the school council which involved public speaking (C30). Children were also given increasing responsibility for their own health and wellbeing based on their perceived competence, especially in relation to *"reading my own food labels"* if they had a food allergy (C10, also C7). Similar sentiments were expressed by a parent in relation to their child learning to avoid situations

which would cause an eczema flare up, such as a grassy field, *"but it's trying to make the right choices as to whether you should go on the field to play with your friends (.) or just stay on the playground"* (P5). These decisions can be difficult for children when everyone else at school is doing something they want to do but they know they have to avoid it for health reasons. The responsibility for health shifts from the parents to the child as children get older and become more aware of their own health needs.

5.4.2.2.2 Impact of pressure on self-esteem

Parents in the sample were very aware of the pressure placed on children and the negative impact it can have on their wellbeing and self-esteem. Some parents found that due to such pressure, the modern school system did not meet their children's emotional needs and therefore resorted to alternative methods to help their children's wellbeing.

> *"P: I sort of managed to get the school to agree for him to do one day a week at a forest school so he was off school for one day a week to learn in a different way, in a different environment and that helped with his emotional development and his ability to cope with stress and I think that has given him a lot of resilience, and he now knows he can cope with anything."* (P13)

The forest school was mentioned by several parents as an alternative or a complementary addition to regular schooling, and was noted for its ability to improve children's self-esteem, feelings of self-worth, coping strategies and behaviour (P26, P28, P29). Alternatives such as the forest school provide a way for parents to introduce some balance into children's lives. An increased range of activities outside of academic study can contribute to children's physical and emotional development and thereby positively impact their self-esteem and ability to cope with stress. As one parent noted, academic achievements come at a price, such as the benchmarks getting higher the better you get at something, *"this is part of the problem because you're a big achiever (.) to get the next praise you have to do that much more than a lot of other people"* (P5). Continued pressure can lead to lower self-worth and self-esteem.

Sometimes pressure had a mixed effect on participant's self-esteem. Many of the children were motivated to do well, not just for themselves, but to demonstrate their self-worth to others. For example one child did not do as well as they had hoped during a swimming lesson and was worried about what their coach and other people thought about their ability.

> *"I: So how do you think you've managed to get over that?*

C: Well I thought that I didn't have a good day um (.) so I told myself not to worry because there's always another chance to prove that you're better than (.) that particular Saturday" (C14)

This participant coped well with the disappointment of not performing their best by positively reframing the situation in terms of future opportunities to showcase their skills, showing resilience in the face of adversity. Other children also displayed a remarkable level of motivation, for example one child went above and beyond when applying for an IT support role at school by preparing a PowerPoint presentation to show during the application process but noted that other people in their class did not have such strong motivation, *"but some of the people that got the job didn't even bother to do anything"* (C27). The fact that children had to submit an application for this role, attend an interview and directly compete with members of their class clearly demonstrates the pressure they receive in the school environment. Although realistic this is perhaps a bit too much pressure for children under 11 years old who may take rejection badly at this early stage in their lives.

5.4.2.2.3 Worry and rumination

Worry was a big feature of participants' narratives and was strongly related to the pressure on children to thrive. Some participants mentioned the growing number of issues they worried about, for example feeling that they had to worry about everything (C31), and that worrying was a part of daily life, *"every day I worry about something (.) school stuff, home stuff, everything"* (C22). It was clear in the interviews that sometimes these worries had such an impact on participants that they transformed from worry into rumination, for example one parent noted that their child *"carries stuff with him"* (P37) and another commented on how their child ruminated on problems for a long time.

"P: Longer term problems well (.) they just (.) he lets them bubble over, keeps them, keeps thinking about them (.) and they er they tend to kind of hang around for a while" (P25).

The parent's use of language in the second extract implies a judgement that rumination is not the best way of coping with problems e.g. the term "he lets them". This fits in with an assumption that there are good and bad ways of coping. The extract also suggests that parents are aware that temperament can have an important effect on outcomes. Rumination was discussed by the children as well as their parents with several of the participants commenting on how they cope with things well during the day but when

they try to sleep at night they can't stop thinking about their problems and worries (C18, C31).

> *"C: When I go to sleep I panic, like as soon as my head hits the pillow if I don't have internet and I can't go on YouTube, my head, I start on like a mini panic attack cos like my head, you think about everything and it's really annoying, you need to make your life perfect but it's never going to be perfect but you really start panicking and it's not very nice"* (C18)

In this extract it is clear that rumination has a negative impact on the participant and that her worries about multiple aspects of daily life are a real source of concern to her. The pressure to be good at everything and to be "perfect" is an indication of the burden of pressure she feels from multiple sources, and the impact this has on her ability to cope.

5.4.2.3 Fear of the unknown

Childhood can involve a number of different fears and worries relating to both major life events and changes, as well as smaller, but more frequent, daily hassles. The inability to know how situations are going to unfold or what events may happen in the future can be very stressful for children. Unknown stressors were a significant feature of children's narratives about their experiences of stress, particularly in relation to coping. If a stressor was familiar it was deemed as easier to cope with whereas a novel stressor was harder to adapt to. A strategy that was found to be helpful for dealing with unknown future stressors was increasing awareness through information gathering; as improving knowledge and awareness was a way to make unfamiliar stressors more familiar and therefore easier to cope with.

5.4.2.3.1 The future as an unknowable entity

The future is unpredictable and this may be more noticeable for children than for adults; adults have more life experience and so may be able to make more accurate estimates of how situations or events are going to conclude. Children are still learning about stress and how to cope with it, and thus have less experiences to draw on when thinking about the future. Worrying about the future occurs when children are facing a new stressor such as a change in routine, for instance when a parent changes jobs roles (C30, C31), a parent is away for long periods of time (C7, C34), or when a child changes schools (C13, C26). This uncertainty can be unnerving, for example in the following extract the participant was summoned to the deputy head teacher's office but did not know why.

"C: Well er I went in and I was quite scared cos I didn't know what I was going to talk to her about, and I thought it was a different situation that I was going to talk to, but it was a situation I wasn't actually ready for" (C20)

For this child, not knowing how this situation was going to go made the experience more stressful as she was not able to mentally prepare for the encounter. C10 also highlights how having the ability to prepare for a difficult or challenging event is a useful coping strategy that will be discussed further in the candidate theme about awareness (see section 5.4.2.3.3). One parent distinguished between how their child copes in advance of an unpredictable stressor and how they cope at the time.

"P: So I think for [participant] *in particular it's sort of when there's going to be that change and you don't know what it's going to be, so he often feels quite hesitant about that (.) if he knows that a change is coming he feels worried about what it will be like but then when the change actually comes he copes with it really well"* (P31)

This quote suggests that anticipation stress could be worse than the stressor itself.

5.4.2.3.2 Novelty versus familiarity of stressors

As discussed in the previous section, not knowing what is going to happen in the future can be quite nerve-wracking for children. Therefore, novel situations can be stressful, so when children are experiencing an event for the first time it can feel more challenging than an event they are familiar with. Many situations are novel to young children, whether it involves a new place or new people such as starting a gymnastics class (C32), a new experience such as being told off by a teacher (C17) or giving a speech in public (C30). This link between novelty and higher feelings of stress was directly stated by several of the children and their parents.

"I: So how did you feel when you knew you had to give a speech?

C: Um ((pause)) I felt really scared and nervous

I: Yeah (.) why do you think you felt scared and nervous?

C: Cos (.) um it was my first time standing in front of the class (.) other people like [Friend 1] *(.) my friend (.) it's about like her fourth and it was my first"* (C30)

In this situation, the participant infers that her friend, who was also giving a speech, would be less nervous because they had experienced public speaking before. Whereas the situation was new to the participants and therefore more stress inducing. Comparable statements were made by other participants when discussing familiarity with a situation

such as people making cruel comments to them: *"cos it happens so frequently I don't really feel that offended*" (C8) and in response to a recurring illness *"I can cope because I had it a lot"* (C15). Being familiar with a situation, even an unpleasant one such as bullying or illness, makes it more bearable. Therefore, some stress exposure can be beneficial in terms of reducing novelty and improving coping strategies.

Similarly, even when an event itself is unfamiliar, having aspects of familiarly made it easier to cope with, for example starting a new school can be a nerve-wracking experience however several participants noted that knowing other children at the new school decreased their nervousness.

> *"I: Okay (.) so how do you think you coped with changing schools? So you mentioned you didn't find it too stressful?*
> *C: No it was okay, like I had four girls from my primary school in my tutor group and I knew most of them from like Brownies and other places so I literally know everyone in my tutor group which is really nice"* (C18)

Seeing familiar faces in an unfamiliar situation made the change easier to cope with.

5.4.2.3.3 Awareness helps overcome fear

One coping strategy that participants seemed to use to combat fear of the unknown was awareness or information gathering. As children get older they become more aware of the context of situations and this knowledge can help them to cope better, for example when discussing a health problem present from birth one participant commented on his growing understanding of the situation over time.

> *"C: Um I was quite young so I didn't really understand it at first um (.) but as I grew older I um knew about it um (.) I was okay about it"* (C11)

This extract suggests that a better understanding of a situation can aid coping, perhaps in terms of choosing a situation-appropriate coping strategy. Awareness and openness were also key for other participants coping with issues such as parental chronic illness and death.

> *"C: I already knew that he had an illness though so that kind of helped (.) but I know a few people who have had it sudden like um (.) I forgot her name, they don't like to talk about it though ((pause)) they don't like to talk about it cos they, he literally just died, their dad died just suddenly, they didn't have any like (.) warning"* (C1)

This participant was making a comparison between her own experience of knowing that her father was dying and her sister's friend whose father died suddenly and with no warning. Although both situations described are extremely distressing, the participant rates her own situation as favourable as the awareness that her father was dying helped her prepare for it and cope with it whereas the shock of a sudden and unexpected death was seen as far worse. The fact that the participant can positively reframe her own experience highlights how well she has coped with a very upsetting and difficult experience of parental death as a young child.

Some participants mentioned information gathering as a way of giving themselves more knowledge and awareness and thereby improving their ability to cope with situations.

"I: How much did you think about starting your new school?

C: I probably thought about it the day before

P: You did ask your sister a few questions a few days before didn't you? So you must have been thinking about it. Because you asked her 'where would I go?', 'what do the signs mean?' and that kind of thing" (C16 and P16)

This participant gathered information about his new school by speaking to his sister, who already attended the school. Several of the participants asked other people, such as family and friends, for advice and information so they could better prepare for future situations. The knowledge and expertise of others was a source of comfort for many participants, particularly in novel environments, such as a school caving trip: *"they were really prepared, they made us (.) hold on to a rope so we'd know where we were going"* (C1). The knowledge that other people had the expertise required for the trip decreased the participants' feelings of nervousness. Alternatively, some participants aimed to enhance their own skills in order to be better prepared, for example one participant took a bike ability course in order to feel more confident about completing a charity bike ride (C8).

5.4.2.4 Learning life's lessons

As discussed in the previous sections, childhood is a time of novelty; children encounter an abundance of situations that are new to them, and some of them can be stressful. Therefore the ability to learn from stressful experiences and how to cope (using a variety of coping strategies) are two important life lessons that can be acquired during this time. The context-dependent nature of stress was also evident in their narratives and an emphasis was placed on how major life events and daily hassles were perceived differently by different people. A life event or hassle that was extremely stressful for one child may

not be demanding for another child. The passage of time was also found to be helpful in children's recovery from stress, as even the most serious worries seemed to be forgotten over time.

5.4.2.4.1 Learning from stressful experiences

In the present study participants discussed a wide range of stressors, of which even the smaller stressors can be a learning experience. Examples include learning why they feel annoyed when they are interrupted by a friend or sibling during a task (C13, C15, C16), how they felt about getting into trouble (C6, C17, C37), that illness can be restrictive (C10, C11, C14), and that it can be difficult to alter instant reactions to events (C9). Encountering stressful experiences in childhood can be difficult, but stress can also be beneficial as it teaches useful skills which can be applied to future stressors. For example one parent remarked that bullying, although horrible at the time, could have potential benefits: *"I like to think that in the long term she will learn lots from it"* (P2). This future-oriented viewpoint could be considered a useful mechanism for turning stressful experiences into important life lessons. In fact, in the present study parents often reframed situations that children had found difficult as learning experiences, such as when participants did not do well in a gymnastics competition parents talked about learning that more practice would be needed next time (P20). This positive reframing was also used by children themselves, for example one child commented on what they learnt from being told off: *"it feels bad but it also feels ok because it means that if you get told off you know that for next time you don't do that"* (C27).

Interactions between children and their parents could also act as opportunities for learning, for example one child overheard an argument between her parents which she discussed with her mother the next day.

> *"P: We both talked about the fact that adults make mistakes as well as children which is quite useful of them to know um (.) and it makes them feel better about when they do stuff wrong, that we're sometimes worse than children"* (P35)

Another parent-child dyad used the example of competitiveness in other children, particularly in relation to competing over who had done the most revision for an exam as a *"useful life lesson as you learn (.) the filter to put on that stuff"* (P36). In this case the child exhibited a developed understanding of how some people display a confident façade but underneath they were just as nervous as other people about their exams. In other extracts it was clear that the learning was an ongoing process, with children trying to apply lessons

they had encountered during stressful events, for example sharing problems with their parents in the future rather than keeping them to themselves (C4, P8).

> *"P: I was saying to* [participant] *that 'you might have problems that are more difficult' and I was just saying that it might be good if he did say something sooner"* (P8).

Another important lesson that children in the sample discussed was the link between stress and illness. The knowledge that stress and illness affect one another was evident in many of the participant's comments, for example several of the participants linked stomach problems with nervousness (P8). Two of the participants reported a *"funny tummy"* about sports competitions (C15, C16), another had *"tummy ache"* after being told off by their judo coach (C17), and one *"couldn't keep the proper stomach control"* before a music exam (C6). Other participants reported headaches (C18), feeling itchy (C26) and flare-ups of conditions such as eczema (C5, C6) when they were worried. One child who was being bullied at school had numerous physical effects from this psychosocial stress, such as she stopped eating, felt sick and could not sleep due to worry (C1). The interaction between stress, illness and sleep was also mentioned; lack of sleep was given as a potential reason why an incidence of the common cold dragged on for longer than usual (C2). Stress was also mentioned as a contributing factor for children not getting enough sleep due to worry and rumination (C15, C20).

5.4.2.4.2 Stress is context-dependent

Lessons were also learnt in relation to the characteristics of stressful events, such as how the build-up or anticipation of an event can often be more stressful than the event itself (C36), and that whether something is perceived of as stressful can be situation and person-dependent (C10, C13). Many participants commented on stress levels and coping ability being dependent upon the type of stressor, e.g. whether it was a major life event or a daily hassle. For some children major life events were more stressful than daily hassles.

> "*P: He (.) copes very well with the day to day stuff but if there's a big change coming he gets anxious about that"* (P32).

On the other hand, some parents commented on their child's ability to cope well with major life events but not manage well with daily stressors or hassles (P2, C11, C18, C36).

> *"P: I'd say that some of the day to day roller-coasters of emotions can be quite stressful can't they? In a kind of ongoing basis (.) things not always working out*

how she wants them and reacting to that ((pause)) I mean yeah, I see her talking to you now and I think about these big life events and I think she's fairly resilient but then something kind of happens that's not the way she expects and she falls apart" (P20)

For this participant day-to-day hassles had more of an impact on her feelings and behaviour than bigger life events. Resilience was mentioned by the parent in relation to major life events suggesting that being able to cope well with these events was a display of resilience but was not mentioned in relation to smaller events. Other parents also noted that hassles such as falling out with siblings *"has the biggest continued (.) impact on her (.) on an almost daily basis"* (P5, also C7, P17) and children commented on how these hassles were a "*sort of a routine"* stressor for them (C5). These daily hassles also include being asked by parents to do chores (C4), falling out with friends about football (C30), and worrying about remembering the right equipment and homework to take to school every day (C36). Clearly an issue which arises day after day can have a cumulative effect on emotions and behaviour as it feels like a constant presence rather than a larger one off life event.

This cumulative effect of stress was also remarked upon in terms of the number of stressful events occurring at once, so it was not necessarily the stress caused by each individual event but the stress caused by the amount of stressful life events: *"we did have three life events happening at the same time"* (P5). This example came from a parent who commented that she would have coped well with the events separately but it was too much to deal with because they all happened at the same time.

5.4.2.4.3 Learning how to cope with stress

As well as learning about stress from life events, children also learnt about how to cope with stress, particularly in relation to which coping strategies made them feel better and which did not help. In the previous section the situation-dependent nature of stress was discussed, and in this section there will also be a focus on how the success of coping strategies are dependent upon the type of stressor. The conceptualisation of coping outlined in chapter four will also be used in this chapter to differentiate between problem-focussed, emotion-focussed and avoidant coping categories. See Table 5.3 for an overview of the types and strategies of coping in each of the three coping categories and which participants used which strategies. Each of these categories will be discussed in turn throughout this section.

Coping strategies were not static, but changed over time, for example one parent noted that their child's ability to cope had improved after they were bullied, suggesting a positive outcome of a stressful experience (P6). Use of coping strategies was also situation-dependent, for example one participant reported using emotion-focussed coping (such as shouting and release of anger) when dealing with siblings but was more likely to use avoidant strategies with other problems (such as trying to forget about it) (C25).

Parents encouraged the use of problem-focussed coping skills such as problem solving, cognitive restructuring and social support. Social support was discussed in depth in an earlier theme (navigating the social minefield, section 5.4.2.1.3) and so will not be focussed on in this section. Strategies used by participants included positive thinking, making practical changes, trying to sort out the problem, as well as parents using reward systems to encourage participants. Participants often used several strategies to deal with a problem.

> *"P: I think he's more of a try to sort out the problem, try to see why it went wrong and then so that it doesn't happen the next time, he doesn't get angry, doesn't shout and scream outwardly, definitely tries to control himself um (.) you do, he does try and see the good things, you try and see what you can learn from it don't you?"* (P16)

This parent commented on two problem-focussed techniques: their child's ability to try to sort out the problem (problem solving) and to focus of the good side of things (cognitive restructuring) in order to learn from stressful experiences. These coping techniques can be very useful especially in combination, as they are present and future-focussed, rather than spending time focussing on negative events in the past. Writing down feelings about a stressor can be similarly future-focussed as it can aid children in moving on from these negative feelings.

> *"P: So he wrote down the things that were worrying him on a piece of paper and we put it on a big tray didn't we, and what did you, you covered it in vinegar and food and gloop and water and mashed it up and threw it away (.) we threw away the bad feelings"* (P32)

This parent has taken a problem-solving approach, using a practical task, to help their child release their worries. It also enabled the child to leave behind their bad feelings which is a form of cognitive restructuring, with a focus on positivity and the future.

Table 5.3

Participant use of coping strategies grouped by type and category of coping

Coping category	**Type of coping**	**Coping strategy**	**Participant number**
Problem-focussed coping strategies	*Problem solving*	Making practical changes	C1, C4, C8, C9, C13, C29, C30, C33, C35, C37, C38
		Trying to sort out the problem	C4, C6, C7, C12, C14, C16, C18, C28
		Reward systems	C11, C15, C32
	Cognitive restructuring	Positive thinking	C1, C8, C10, C13, C14, C16, C17, C21, C24, C26, C28, C29, C31, C33, C37
Emotion-focussed coping strategies	*Blaming others*	Blaming others	C2, C20, C30, C36
	Emotional regulation	Crying	C5, C6, C12, C14, C17, C20, C21, C22, C23, C35
		Shouting and screaming	C5, C13, C15, C16, C20, C24, C25, C27, C28, C30, C34, C35
		Throwing, kicking and smashing objects	C10, C21, C28, C30, C36

		Fighting and violence to self	C5, C9, C24, C25, C28
		Prayer	C1
		Drawing and writing	C1, C10, C27, C29, C32
		Repressing negative thoughts	C4, C6
Avoidant coping strategies	*Distraction*	Finding distractions	C3, C6, C11, C13, C15, C16, C18, C20, C21, C23, C29, C30, C31, C33, C34, C35, C36, C37
		Finding something else to focus on	C13, C21, C30, C36
		Trying to forget about it	C5, C12, C13, C16, C20, C27, C28, C29, C36, C37
	Social withdrawal	Dealing with problems alone	C10
		Keeping quiet	C8, C28, C31, C32
		Leaving the stressful situation	C3, C7, C8, C9, C12, C15, C17, C19, C20, C23, C27, C28, C32, C34, C37, C38
		Staying by oneself	C11, C12, C14, C15, C26, C29
	Self-criticism	Blaming oneself	C4, C20, C28, C31

Participants also discussed emotion-focussed coping strategies including blaming others, repressing negative thoughts, prayer, and emotional expressions or outbursts such as crying, shouting or screaming in anger; throwing, kicking or smashing things; and fighting and violence towards oneself.

> *"C: One more tactic that I sometimes do (.) Like I'll go outside sometimes (.) and like smash a ball (.) kick the ball as hard as I can or something ((pause)) like if you're all contained just let it all out (.) and then once I run around and get tired (.) that's when the problem goes away"* (C10)

For this participant it was only when he released his negative feelings about a stressful event that he felt better; releasing anger was a cathartic experience for him. Crying was also found to be cathartic for many participants, supporting that idea that releasing your feelings can make you feel much better and also diminish the impact of the stressor (C35).

Other forms of emotional expression were used by participants, including creative techniques such as drawing and writing about their feelings and emotions (writing has been briefly discussed from a problem-focussed viewpoint but can also be considered as emotion-focussed). These outpourings of emotion using creative means helped children to unburden themselves from their negative feelings and the stressful event itself. One parent noted that if her son was upset or annoyed about something he would often sit down and draw *"not so much drawings of the problems, but depictions um (.) of his feelings around the problems"* (P10). The same child acknowledged how helpful he found this technique.

> *"C: When I'm drawing I feel like I'm in my own world completely (.) and like oblivious to everything else that's happening so (.) it really kind of makes my mind go a bit blank and calms me down ((pause)) like just (.) blurt it all out onto the paper (.) and then like, it kind of goes from me onto the paper"* (C10)

For this child drawing pictures about his feelings was helpful in two ways, firstly by focusing his mind on something else and secondly in relation to releasing negative emotions. Writing or drawing can be seen as a transference of feelings from the person to an object (i.e. the paper). Several participants commented on how if they talked about or wrote down how they were feeling this shared their burden and thereby helped them feel better (C10, C20).

Avoidant coping strategies included blaming oneself, dealing with problems alone, finding something else to focus on, keeping quiet, leaving stressful situations, staying by oneself, trying to forget the problem and finding distractions. A wide range of distractions

were used by participants to help them forget about their problems, including playing computer games or on an iPad (C3, C6, C16, C30, C34), playing sports (C11, C17, C37), playing with toys (C5, C12, C15, C26), and reading (C13). Avoidant coping is often viewed in the literature as a maladaptive coping strategy however, in the present research, distraction (an avoidant coping strategy) was noted by many participants to be very useful in helping them deal with their problems.

> *"P: He kind of worries about stuff so we've been trying to teach him if you just try and do something that makes you feel good to take your mind off it like skateboarding, doing something physical makes you feel better (.) and also just to find positive endorphins really, to make you feel good so it changes your emotions (.) to find a way to help them cope in the future. If you start to worry or you're upset you know you can change your mind-set if you go and do something different"* (P37)

In the above extract the form of distraction used was skateboarding. Not only could this act as a helpful distraction from problems but, as the parent notes, doing something physical can positively affect physiological responses, such as hormones, and thereby increase mood. The parent was aware of the importance of their child learning good coping strategies in the present which will also benefit them when faced with future stressors.

5.4.2.4.4 Time heals all wounds

Another important life lesson that was found during analysis of the interviews was that the passage of time can have a healing influence on stressful experiences that, at the time, seem hard to recover from and hard to forget. In the interviews some parents would describe a past event that their child had found exceptionally stressful, and often the child would have forgotten about the event or moved on from it successfully so that it no longer bothered them. The latter could suggest that children were displaying resilience to stress.

> *"P: Mmm he would cry most days before school (.) You've (.) you've forgotten haven't you, how bad it was? (.) I think there was a whole week when you said you were ill when you weren't"* (P6)

This extract demonstrates that a serious problem, in this case bullying, can be forgotten over time. The child was deeply upset by the bullying when it was happening and often tried to avoid school, however since moving to another school he was much happier and had managed to forget about this stressful past experience. Often the parents were very surprised that their child had forgotten something that was "*a big trauma for her at the*

time" (P27) and had moved on so far as to be able to make jokes about it (C2) as adults tend to find it quite hard to let go of negative past events.

Some children were more aware that they felt differently now to how they felt when they had encountered a stressful situation in the past (C8), even those who had encountered very serious stressors, such as the death of a parent.

> *"C: But now I deal with it so much better, it's kind of like it happened, it's finished, it's done and everyone's always like 'are you okay' and I'm like 'it happened two years ago, it's gone, don't worry'"* (C1)

In the example above the child displays remarkable resilience in her ability to cope with such a traumatic event, as well as a clear focus on how other people remind her and respond to the event. Generally parents tried to encourage children to move on by telling them that their worries about past events *"belong in the past"* (P32). Many parents remarked on their child's resilience and ability to cope with stress (C2, C6, C8, C10, C13) especially in terms of being able to recover quickly from events which was seen as advantageous (C29).

> *"P: I would say she's more resilient than that, this thing on Saturday, the gym thing, you were really really upset, in floods of tears, you felt very very sad, but you talked about two hours later with* [grandma] *and she said 'how did your gym competition go?' and you were able to talk about it quite happily, you didn't get upset again"* (P20)

Parents were pleased when their children moved on from events quickly even though, as mentioned above, adults often take a lot longer to recover. One parent directly compared how quickly her daughter moved on from a bad falling out with a friend but how it took a lot longer for her, as the mother, to forgive the friend (C7).

5.5 Discussion

This section will focus on the main conclusions that can be drawn from each of the four themes, and will relate these findings to the wider literature, although the literature is somewhat limited as many of the topics of this study have not been examined using qualitative methods before. The section will then move on to a discussion of the strengths and limitations of this research before concluding.

5.5.1 Navigating the social minefield

One of the main conclusions to draw from this theme is that trying to manage social relationships makes up a considerable proportion of the early life stress and adversity experienced by young children. The importance of being able to successfully navigate social relationships was highlighted in the literature by Waaktaar, Christie, Helmen Borge, and Torgersen (2004) who developed an intervention which successfully enhanced resilience by increasing positive peer relationships, self-efficacy, creativity and coherence. Similarly, in a study of adolescents, close friendships and perceived friendship quality were positively associated with resilience (Graber et al., 2015), as were social support and self-efficacy (Yendork & Somhlaba, 2015). This research supports the findings of the present study, not only in terms of highlighting the importance of successfully managing social relationships, but also the positive effect that social support can have on children's outcomes.

Bullying was also a key feature of children's narratives which seems fitting as the most recent statistics revealed that 43% of young people have been bullied (Annual bullying survey, 2015). Appearance was listed as the main reason for bullying and the highest risk factors were disability; being lesbian, gay, bisexual, or transgender; and low income backgrounds (Annual bullying survey, 2015). Although bullying was mentioned frequently in the present sample it was mentioned by less than 43% of the participants which could be explained by the moderate to high SES of the sample. Bullying was shown to have a negative psychological impact on children, such as feelings of isolation and exclusion, if not dealt with effectively early on. Bullying took many forms, including physical and emotional harassment. As well as having a psychological impact research suggests that bullying can impact children's physiological stress responses to acute social stress, as well as leading to more negative health outcomes (Knack et al., 2011). Similarly, the need to belong in social groups has been shown to impact health, for example higher feelings of social belonging was correlated with fewer physical illness symptoms (Began & Turner-Cobb, 2012).

Social support was shown to be a helpful strategy for a variety of stressors, and took many forms including being listened to and understood, being reassured, and establishing physical closeness. In a review of resilience and adversity research in children Masten, Best, and Garmezy (1990) found that children cope more successfully with early life adversity when they have parents or caregivers who provide them with social support, highlighting the importance of social support for positive outcomes. Parental social support

has also been found to be effective at buffering cortisol reactivity in response to a social stressor in young children, although this effect decreases as children move into adolescence (Gunnar & Hostinar, 2015; Hostinar et al., 2015b). Similarly, the findings in the present study suggest that reassurance can be helpful for children coping with social stressors such as changeable friendships. Reassurance has been investigated in relation to hospital stressors; researchers found that reassurance was helpful for those with low level worries but not for people with high anxiety (Lucock, Morley, White, & Peake, 1997).

5.5.2 Pressure to thrive in the modern world

Participants experienced pressure to do well from numerous sources, including school, extracurricular activities, as well as increasing responsibility for their own health. This pressure came from themselves as well as parents and schools, with some research suggesting that children are being "hurried" to grow up (Elkind, 2001). Research with adolescents has suggested that they also experience stress from multiple sources including peer pressure, home life, school performance, and adult responsibilities (Moksnes et al., 2010).

This pressure can have a positive or negative impact on the child's self-esteem and feelings of self-worth, depending on the nature of the stressor and the child's resources. Similar findings have been established in the wider literature, with an emphasis being placed on children's personal resources for coping and resilience. In order to succeed under pressure these children showed evidence of some of the psychosocial skills relevant to resilience such as self-efficacy, creativity, and self-regulation (Lavoie et al., 2014; Waaktaar et al., 2004; Yendork & Somhlaba, 2015). Aspects of personality and temperament, such as self-esteem, perceived competence and coping ability, were discussed in the interviews in respect to helping increase resilience. This finding was mirrored in the literature, for example Smith and Prior (1995) found that positive temperament was a protective factor in developing stress resilience. Characteristics such as novelty seeking have been linked to lower cortisol levels in adult stress testing (Tyrka et al., 2007) and self-esteem has also been shown to be protective in relation to social stress in adolescents (Moksnes et al., 2010).

As well as the positives of pressure on coping and resilience there were also negative impacts, for example prolonged worry and rumination. Rumination has been found to be a vulnerability factor in research with adolescents aged 11 to 15, moderating the relationship between stressful life events and future psychopathology (Abela & Hankin,

2011). Similarly, adolescents who ruminated more took longer to recover from a social stress test (Stewart, Mazurka, Bond, Wynne-Edwards, & Harkness, 2013). Masten (2014) also noted that striving to achieve goals can sometimes have a negative effect as the action of striving for something can be taxing on an individual's coping resources. Other research has corroborated the idea that striving for perfection can lead to distress, and have suggested that rumination can be a mediating factor in this relationship (O'Connor, O'Connor, & Marshall, 2007).

5.5.3 Fear of the unknown

If the outcome of a situation is unknown then research findings suggest that people are less able to mentally prepare, which can lead to increased worrying. For example, Hart and Bossert (1994) found that fear of the unknown was a big part of children's fears during hospitalisation. Children tended to cope less well with upcoming events when they were unknown, but once the stressor had been encountered and was therefore no longer an unknown entity, children were able to cope much more effectively. This links to the concepts of novelty and familiarity; being familiar with a situation tends to lead to better coping than novel situations. The movement from novel to familiar situations was discussed by Kent, Davis, and Reich (2014) who suggested that when children encounter *"positive early experiences"* (p. 125-126) their internal model is able to shift events from novel to familiar, which facilitates their development.

Awareness or information-gathering was found to be an effective way for children to cope with unknown stressors. Information-gathering is an active form of coping which falls under the problem-focussed coping category and has also been found to be a successful coping strategy for children awaiting surgery (Thompson, 1994).

5.5.4 Learning life's lessons

Some key life lessons were discussed, such as how stressful events can teach children a lot about coping and how to respond to stress in the future. This theory has been embraced in the literature in relation to categorisations of stress, e.g. positive stress, and in the field of post-traumatic growth, which considers the positive effects that stress can have (Tedeschi, Park, & Calhoun, 1998). Characterises of the stressor were found to impact coping, suggesting that perceived stress and coping are context-dependent, a view that has been emphasised in stress and coping theories (Lazarus & Folkman, 1984).

Using the three-factor categorisation of coping strategies outlined in chapter four it was found that a broad range of strategies from across the factors were utilised by children in the present sample. Strategies such as social support (previously discussed) and problem-solving ability were listed as significant factors for successfully coping with adversity (Masten et al., 1990). As detailed in the literature review the success of the different coping strategies is dependent upon both personal and situational factors. A wealth of research has been carried out in adolescent populations comparing the coping strategies used by healthy and chronically ill young people. This research has found that chronically ill adolescents used more maladaptive coping than healthy controls (Escher & Seiffge-Krenke, 2013). The same group of researchers also found that perceptions of autonomy were important in determining which type of coping strategies participants would use, with higher perceived autonomy associated with greater use of active coping strategies (Seiffge-Krenke & Pakalniskiene, 2011). Perceived stress was also found to interact with coping style, for example high levels of perceived stress were associated with more active coping strategies (Seiffge-Krenke, Aunola, & Nurmi, 2009).

Another important life lesson was that the passing of time helped children to recover from stress and prepare themselves for future stressors; this could be through letting go of negative past experiences or developing resilience. Egeland, Carlson, and Sroufe (1993) suggest that resilience is not an intrinsic feature but *"a capacity that develops over time in the context of person-environment interactions"* (p. 517) suggesting that both time and experience of stress can help enhance resilience.

5.5.5 Strengths and limitations

As the first study to investigate stress, coping and illness in children using qualitative methods, this study has many strengths in terms of novelty and revealing a unique discourse on issues of importance to young children. It utilised an innovative methodology in terms of interviewing child-parent dyads to elicit a deeper understanding of the topics from both perspectives. The themes found in the interviews in the present study support the findings of the predominantly quantitative research literature discussed above and also support key theories of stress and coping. This study also benefited from a large sample size, with over 30 participants interviewed and their data analysed, which enabled a comprehensive examination of the topics.

However, there were weaknesses with this study. Firstly, the participants were from a predominately high SES background leading to quite a homogeneous sample. This

feature of the sample could be due to the high SES of the local area. As participants had to travel to the university for the second part of this study the geographical area for recruitment was small. Future research would benefit from sampling participants in lower SES areas, perhaps recruiting from outside the local area and paying participant's transport costs to the university. Secondly, although the use of semi-structured interviews was an appropriate method for the research questions, a lot of topics were covered in the interview. This could have been fatiguing for the young children participating in this study and could have prevented participants going into as much depth about each topic as they would have with fewer topics.

5.5.6 Conclusions

The present study considered children's experiences of stress, coping and illness through their own narratives and those of their parents. The research developed four themes from the data which identified the breadth and depth of children's experiences of stress and illness, as well as important findings in relation to how children cope with stress. Many of the candidate themes addressed the impact that stress can have on psychological wellbeing, for example the impact of pressure on self-esteem. Several psychosocial factors, such as social support, self-esteem and other aspects of personality and temperament, were found to be beneficial in the development of resilience. Support for these findings was found in the wider stress and coping literature.

Chapter six: Study three

6.1 Chapter overview

This chapter discusses the second phase of a two-part study investigating acute stress responses and coping in children classified into four stress-resilience groups (described below). The first part of this research project was discussed in chapter five, and involved in-depth qualitative interviews about stress, coping, and illness with children and their parents. In the present study these interviews have been quantitatively coded into four groups consisting of children who have experienced high and low levels of stress and displayed high and low levels of resilience.

Thirty-four of the thirty-eight participants from study two took part in the Bath Experimental Stress Test for Children (BEST-C) which was created and tested in study one. The stressful life events, daily hassles, and coping questionnaire data collected in study two were analysed in this chapter in association with the cortisol and heart rate data collected during the present study. Participants were interviewed after the BEST-C about their experience of the task.

An increase in cortisol was found during the anticipation period and children self-reported that they found the task stressful confirming study one's findings that the BEST-C is an effective social stress test. However, contrary to study one there was no increase in cortisol in response to the BEST-C in the present study. The findings of the present study suggest that the researcher's presence during the task was a form of social support to the participants which explains the lack of increase in cortisol in response to the task. Heart rate was found to increase in response to the task although due to methodological issues this finding should be treated with caution. Questionnaire data concerning stressful life events and daily hassles supported the findings from study one, with the most efficacious coping strategies varying from emotion-focussed coping in study one to problem-focussed coping in the present study.

Grouping responses into the four stress-resilience groups allowed the researchers to tease out some of the psychosocial factors which characterise resilience and to directly compare the acute stress responses of the children in these four groups. Differences were found between the four stress-resilience groups suggesting that experience of stress and higher levels of resilience factors (such as greater use of social support) are beneficial for coping with an acute social stressor.

6.2 Introduction

6.2.1 Psychosocial factors that impact resilience

The 1960s and 1970s marked the beginning of stress and coping researchers examination of resilience, particularly in regard to children and the development of psychosocial resilience factors (Masten, 2014). Resilience is generally viewed as an interaction between a person and their environment; an approach which emphasises personality and temperament factors, such as social support and competence, as well as promoting resilience within a family context (Bai & Repetti, 2015; Egeland et al., 1993; Lavoie et al., 2014; Smith & Prior, 1995). As resilience is seen as a skill rather than an inherited characteristic there has been a wealth of research aiming to develop and enhance stress resilience (Brownlee et al., 2013; Waaktaar et al., 2004).

As discussed in the literature review in chapter two, the research is divided in its findings about the impact of childhood stress; some research suggests that it can have a positive effect (and lead to resilience), whereas other research suggests that stress can have a negative impact. Experience of adversity such as the stress associated with the transition to school can have a positive impact on children's stress responses and increase positive health outcomes, suggesting that early experience of stress can lead to children becoming more resilient to future stressors (Turner-Cobb et al., 2011). Other research has highlighted some of the potential negative consequences of early life adversity, such as effects on cognitive functioning, emotional and physical development (Ehlert, 2013). This research highlights the importance of researching early life adversity and its impact on resilience to future stress.

6.2.2 Contextualising the present study within the broader research programme

The present study builds upon the findings of the previous two studies; it applies the BEST-C (developed and tested in study one) to a population for which in-depth data has been collected regarding stress experiences and resilience factors (data collected in study two). Furthermore, it involved coding of the interviews conducted in study two to create the four stress-resilience groups which will be analysed in association with the cortisol and heart rate data from the present study. This integration of qualitative and quantitative data helps build a more holistic picture of children's stress experiences and resilience versus vulnerability factors. This will broaden our understanding of resilience and of the individual differences which impact on children's physiological stress levels, thereby adding to the ongoing debate about which individual differences (e.g.

biopsychosocial factors) make some people more vulnerable or resilient to stress and the relationship between stress and resilience factors such as coping (D'Imperio et al., 2000; Masten et al., 1990).

6.2.3 Aims of the research

This is the second part of a two-part study which aims to provide a fuller understanding of the psychosocial factors involved in stress resilience and vulnerability in children. The primary aim of this study was to use data collected in study two to categorise participants into high/low stress and high/low resilience groups and apply the BEST-C to these groups to investigate differences between them in terms of stress responses and coping. The main hypothesis for this study was that cortisol and heart rate would increase in response to the BEST-C. It was also hypothesised that the two high resilience groups would show the lowest levels of cortisol throughout the task, suggesting better adaptation to stress, and that the children with more past experience of stress (the high stress groups) would show less arousal during the task as previous experience would enable them to better cope with it.

6.3 Method

6.3.1 Participants and recruitment

This study, as phase two of a two-part study, was granted ethical approval from the Department of Psychology ethics committee on 12th May 2014 (ethics references number: 14-118). As in the previous studies, an opt-in recruitment method using advertisements in local newspapers, schools and the university sports centre were used to recruit participants. Advertisements invited local families with children aged seven to 11 years to take part in a two-part study involving questionnaires and an interview about experiences of stress, followed by a mildly challenging task and providing saliva samples. Exclusion criteria included having a child and adolescent mental health services (CAMHS) referral, special educational needs (SEN), or taking oral steroid medication (the latter could impact the cortisol data). As detailed in chapter five the email to local sports clubs was the most successful recruitment method for this two-part study (drawing 18 participants), followed by word of mouth (five participants), school newsletters (four participants), the university website (four participants), emails to parents who had expressed an interest in study one (four participants), and newspaper advertisements (two participants).

Thirty-four of the 38 participants from study two took part in the present study (19 boys and 15 girls). The four children who did not take part in both studies did so due to moving away from the area (one participant) or lack of time (three participants). Demographic information such as age, sex, ethnicity, and socioeconomic status (SES) are reported in the results section. The sample was homogeneous in terms of ethnicity (predominantly White British) and SES (middle class). The sample size was over 32 which was the number recommended by the G*Power calculation to ensure adequate power for analysis using MANOVA.

6.3.2 Measures

6.3.2.1 Questionnaires: Demographics, life events, daily hassles and coping strategies

In study two, the first phase of this two part study, questionnaire data was collected about demographic information, life events, daily hassles, and coping strategies. The details of these measures were discussed in chapter four. In the present chapter the questionnaire data will be analysed in conjunction with the cortisol and heart rate data.

6.3.2.2 Stress paradigm: BEST-C

The BEST-C, which was developed and successfully tested in study one, was applied to the participants in the present study. The same procedure as described in chapter four was used to administer the social stress test, however there was one methodological difference regarding the interactions between the participants and the researcher. In study one the participants came to the laboratory having never met the researcher before so they were encountering a stressful situation, a novel environment and a new person at the same time. However due to the multi-phase nature of study two and three the participants had met and been interviewed by the researcher in study two (as detailed in chapter five) prior to coming to the laboratory to take part in the BEST-C in the present study (study three).

6.3.2.3 Salivary cortisol sampling and assays

In study one, four saliva samples were taken throughout the task: a pre-stressor sample to capture a baseline cortisol level, a sample 20 minutes after the start of the stress test to assess peak response, and two samples 30 and 45 minutes after the start of the stress test to capture return to baseline. It was intended that sample one would reflect participant's baseline cortisol levels however it captured an anticipation effect, therefore a sample from the recovery period (sample four) was used as a proxy baseline measure. In

order to avoid this issue in the present study a baseline sample was taken 24 hours before the BEST-C, as well as four samples taken at the same time points detailed above, giving a total of five saliva samples collected. Taking a baseline sample on a control day, rather than on the same day as the stressor, is a technique recommended by several researchers in order to better elucidate how an acute stressor impacts children's normal cortisol patterns (Lovallo et al., 2010; Wolfram, Bellingrath, Feuerhahn, & Kudielka, 2013).

The baseline sample taken 24 hours before the BEST-C was taken at home by participant's parents using a saliva sampling tube. An instruction booklet was given to participants after study two when the researcher explained study three to them. The baseline sample was refrigerated at home by the parents until they brought it to the lab on the day of testing. The rest of the samples were taken by the researcher in the lab.

Rather than using Salivettes® to collect saliva, as in study one, the present study utilised the passive drool technique which involves saliva pooling on the floor of the mouth for a set time (in this case three minutes) and being drooled into a collection tube. Passive drool was found to be a preferable collection method as it is easier to see how much saliva has been collected, thereby avoiding the problem of having samples that are too small to analyse, and it is more quickly and easily demonstrated and collected. Following collection, samples were placed in a refrigerator for one hour before being frozen until analysis.

Analysis was conducted by the researcher under the tutelage of a collaborator in the Department for Health (JT) in the physiology laboratories at the University of Bath. The kits used for the analysis were Salimetrics salivary cortisol enzyme immunoassay kits. The standard Salimetrics analysis procedure was followed, details of which can be found in Appendix G.

6.3.2.4 Heart rate monitoring

As well as using cortisol levels to measure stress responses to the BEST-C, heart rate was measured to further assess physiological stress arousal. Heart rate was measured using a Meditech FOs2pro handheld finger oximeter which measured pulse rate in beats per minute (bpm) and the concentration of oxygen in the blood (SpO_2). The oximeter was applied to the index finger of the non-dominant hand for 30 minutes, spanning the ten minutes prior to the BEST-C (anticipation period), ten minutes during the task (stressor period), and ten minutes after the task (recovery period).

6.3.2.5 Post-test manipulation check: Brief interview

The brief interview used in study one was also used to investigate children's experience of the BEST-C in the present study. The interview questions were outlined in chapter four. The interviews were audio-recorded and transcribed.

6.3.3 Procedure

Parents collected a saliva sample from their child in the late afternoon approximately 24 hours prior to the child coming into the lab. Testing occurred in the late afternoon to account for the diurnal variability in cortisol and all participants completed the questionnaires, stress test and interview in the same order. A timeline of the procedure for this study has been provided in Figure 6.1.

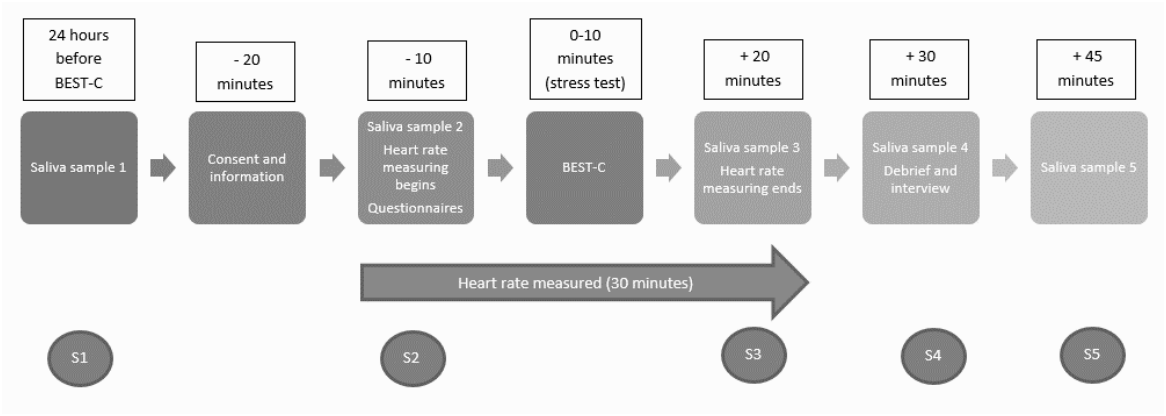


Figure 6.1. Timeline of the study protocol with the timings shown in minutes in relation to 0 (the point when the stressor began). *Note.* The large arrow represents the time during which heart rate was monitored and the small circles represent the five saliva sampling times.

Children were accompanied to the lab by one of their parents (usually the one who was interviewed with them in study two). The saliva sample taken the day before was given to the researcher by the parent and stored in the refrigerator in the lab. Parents were given an information sheet to read and the study was verbally explained to the child participants; written consent was given by the parent and verbal assent was gained from the child.

Detailed demographic information about the participants was collected in study two and reported in chapter five. Additional demographic information such as weight, height

and body mass index (BMI) were collected by the researcher and recorded on the questionnaire. If the interview had taken place more than a week before the BEST-C the daily hassles questionnaire was completed again to take into account any stressors which may have occurred since the time of the interview. Approximately 20 minutes after arriving at the lab children gave their second passive drool saliva sample (the anticipatory stress sample) and were connected to a finger pulse rate monitor. Children were told to move their hand as little as possible while they were wearing the heart rate monitor and were given a few minutes to get used to wearing it. Children were then told the nature of the BEST-C and given a few minutes to prepare for the task.

The procedure for the BEST-C has been described in detail in chapter four and this protocol was followed in the present study. After the task the participant continued to wear the heart rate monitor for a further ten minutes while they relaxed in the debrief room. When the heart rate monitor was removed the participant also gave their third saliva sample (twenty minutes from the beginning of the stress test). The fourth and fifth samples were taken 30 and 45 minutes after the stress test began. Children were briefly interviewed about their experience of the BEST-C, thanked for their participation and given a voucher.

6.3.4 Data analysis plan

Cortisol was examined across the five time points using paired t-tests. Differences in cortisol levels across the time points were analysed using a MANOVA in which age group, sex, and stress-resilience group were entered as the IVs and cortisol at the five time points were entered as the DVs. Follow-up ANOVAs and t-tests examined group effects. Relationships between the psychosocial questionnaire data were analysed using bivariate correlations and ANOVAs.

6.4 Results

6.4.1 Coding and screening the data

Participants were given an ID number to anonymise their data. This number matched the ID they were allocated in study two, therefore ID numbers ran from 1 to 38. ID numbers three, four, five and six do not appear in the present study as they correspond to the four participants who took part in study two but did not participate in study three. As in study one some questionnaire data needed to be coded, some text data required converting into numerical scores, and the study two interviews required coding in terms of high/low levels of stress and resilience.

6.4.1.1 Coding the questionnaire data

The life events, daily hassles and coping questionnaires were coded using the same procedures detailed in study one. Briefly, the weighted life events scores were summed into a total score, scores for the prevalence and severity of daily hassles were totalled, and the coping data was split into two categories (frequency and efficacy) for the three coping groups (problem-focussed, emotion-focussed and avoidant coping).

A health scale, personality scale, health questionnaire (collecting data about overall health, GP and hospital visits, illnesses and infections, days off school, regular medication and allergies), and birth questionnaire (such as birth weight, length, time born on relation to due date, delivery type, birth and pregnancy complications) were also collected in study two. However due to time and space restrictions in the thesis the analysis of these additional variables is beyond the scope of the present study. A potential study using this data could examine the relationship between stress and illness in the past year; this and other prospective research studies will be discussed in the next chapter.

6.4.1.2 Calculating socioeconomic status (SES) scores

The Hollingshead (1975) method detailed in chapter four was used to calculate a four-factor SES score using information about sex, marital status, occupation and education. In the present study 29 parents were married or in long-term relationships, two were single, two were divorced, and one was widowed. In single parent families the main caregiver's scores were calculated, whereas in two parent families the total score was calculated for each parent and divided by two. In families where one parent was not currently employed the score was calculated based only on the working parent's education and occupation.

6.4.1.3 Quantitatively coding the interviews: Creating stress-resilience groups

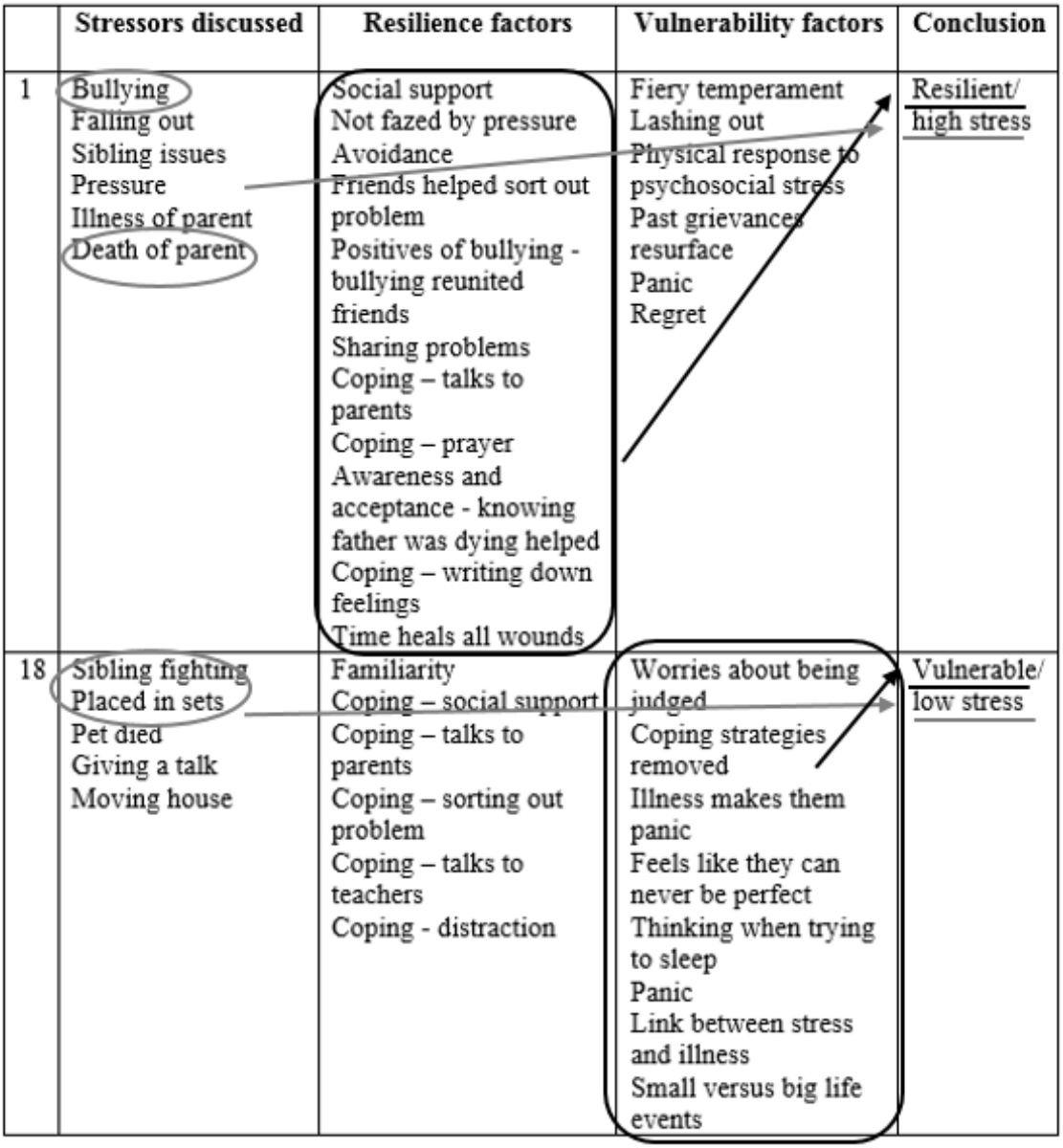
The study two interviews discussed a range of topics including stress, coping, illness and early life events, including psychosocial factors involved in resilience. The questionnaires from study two covered similar topics; both the interview and questionnaire data was used to group the participants into one of four groups: high resilience/high stress, high resilience/low stress, low resilience/high stress, and low resilience/low stress. These group distinctions were based on the work of D'Imperio et al. (2000) who investigated resilient and stress-affected adolescents in an urban setting. Similar categorisation based on stress and resilience was conducted by Masten (2014) who distinguished between children

based on categories of risk (e.g. high/low) and adaptation (e.g. good/poor). In the same vein, Smith and Prior (1995) used child rated stress and negative life events to distinguish between resilient and non-resilient children, and Meldrum, Tsao, and Zeltzer (2009) qualitatively examined the functioning limitations of children with chronic pain and found three groups, designated as adaptive, passive and stressed.

D'Imperio et al. (2000) categorised adolescents into groups based on high and low exposure to stressors and externally exhibited competence (using self, teacher and school reports). The resilient group included participants who had experienced high stress and were highly competent and the stress-affected group included those who had experienced high stress and had low competence scores. These researchers were interested in the impact that high levels of stress had on resilience in adolescents therefore they only analysed these two categories, whereas the present study was concerned with differences between resilient and vulnerable individuals and those who had experienced high and low stress and, therefore four groups were created and analysed.

The researchers used a 29-item life events scale to calculate stressful life events scores for each participant; these scores were summed and the participants were split into two groups based on the median score (D'Imperio et al., 2000). Similarly, in the present study, a life events scale and a daily hassles questionnaire were used; both major life events and everyday hassles contribute to stress, therefore the life events and daily hassles scores were added together and participants were split into two groups based on the median score.

In order to categorise adolescents into resilient and stress-affected groups D'Imperio et al. (2000) used competence scores which were created by combining three sets of scores from students, teachers and school reports. Factor analysis was used to create a standardised score for each factor and then summed; participants were again split into groups based on the median score for competence. In the present study the in-depth interviews were used to determine whether participants displayed high or low resilience to stress. A table was created to include stressors, resilience factors and vulnerability factors discussed in the interviews. The codes for each interview (derived using NVivo, version 10) were placed in the relevant column of the table. A decision about the stress-resilience group allocation was made based on the number and importance of codes in the resilience and vulnerability columns. For an example of the categorisation process see Figure 6.2.



	Stressors discussed	Resilience factors	Vulnerability factors	Conclusion
1	Bullying Falling out Sibling issues Pressure Illness of parent Death of parent	Social support Not fazed by pressure Avoidance Friends helped sort out problem Positives of bullying - bullying reunited friends Sharing problems Coping – talks to parents Coping – prayer Awareness and acceptance - knowing father was dying helped Coping – writing down feelings Time heals all wounds	Fiery temperament Lashing out Physical response to psychosocial stress Past grievances resurface Panic Regret	Resilient/ high stress
18	Sibling fighting Placed in sets Pet died Giving a talk Moving house	Familiarity Coping – social support Coping – talks to parents Coping – sorting out problem Coping – talks to teachers Coping - distraction	Worries about being judged Coping strategies removed Illness makes them panic Feels like they can never be perfect Thinking when trying to sleep Panic Link between stress and illness Small versus big life events	Vulnerable/ low stress

Figure 6.2. Examples of two participants with the stressors, resilience factors and vulnerability factors that were discussed in the interviews as part of the categorisation of stress-resilience groups. *Note.* As can be seen from the circled and underlined codes in the table, the stressors for participant one are more serious and the stressors for participant 18 are less serious; the resilience factors outweigh the vulnerability factors for participant one and vice versa for participant 18.

To ensure accuracy and to validate the categorisation of the stress-resilience groups, the stress groups which were coded using the questionnaires were compared to the interviews, and the resilience groups which were coded using the interviews were compared to the questionnaires. For example, the high/low stress groups determined by a

median split of questionnaire scores were compared to the number of stressors listed by each participant in their interview (see column two in Figure 6.2). The number of stressors listed in the interviews were found to be congruent with the stressors listed in the questionnaires. The personality scale from study two (which included questions about stress responses and resilience) was used as a check the resilience groups as determined by the interviews; these methods were also found to be consistent, supporting the categories the participants had been assigned to, e.g. high or low resilience. The participants in each of the four stress-resilience groups are shown in Table 6.1.

Table 6.1

Participants in the four high/low resilience and high/low stress groups

	High stress				**Low stress**			
High resilience	C1	C12	C13	C15	C8	C10	C11	C19
	C16	C17	C21	C33	C27	C29	C32	C34
					C36	C37		
Low resilience	C7	C9	C22	C24	C2	C14	C18	C20
	C25	C26	C28	C35	C23	C30	C31	
	C38							

6.4.1.4 Data screening

Data screening was carried out using the techniques recommended by Field (2009) and Tabachnick and Fidell (2007). When analysing data using MANOVA it is important to consider missing data, outliers, normal distribution, linearity and multicollinearity. There was no missing data in the sample. Boxplots and z scores were used to screen for outliers in the data. Several participants were found to have extreme scores outside the acceptable range of +/-3.29, specifically participant 13 (for cortisol at time one), 20 (for cortisol at time two, four and five), 30 (for heart rate at time two), and 31 (for cortisol at time two). Participant 13 and 31 each had only one outlier for cortisol data, and participant 30 had one outlying score for heart rate, so it did not seem sensible to delete all three participants and lose all their data, therefore their extreme scores were recoded to the next highest score plus one in accordance with guidance from Field (2009). However, participant 20 had extreme scores for three of the cortisol time points (according to the z scores) and four cortisol time points and one heart rate score (according to the boxplots), therefore this

participant was deleted from the analysis. The rest of the results section refers to a sample of 33 participants.

Normal distribution was examined visually using Q-Q plots of the residuals (z scores) which showed that most of the variables were normally distributed except for the five cortisol samples. Further screening confirmed that the data for these variables was not normally distributed, including looking at the means for skewness and kurtosis (which were outside the acceptable range of -2 to +2), histograms with a normal distribution curve (which showed positive skew), and the Shapiro-Wilk test (which was significant). Due to this, the cortisol data at the five time points was transformed using a Log 10 transformation. Further histograms, means for skewness and kurtosis, and Shapiro-Wilk tests confirmed that the data was normally distributed post-transformation.

Linearity was examined using scatterplots which displayed oval shaped patterns between the variables, and multicollinearity was also found not to be a problem as there were no correlations between variables over 0.9, VIF values over 10 or tolerance values under 0.1.

6.4.2 Descriptive statistics

The means and standard deviations for the demographic and questionnaire data are shown in Table 6.2. Several of the participants in the sample were siblings: four brother-sister dyads, two brother dyads, and one group of three siblings (one boy and two girls), however for clarity their data and demographic information (including parental SES) were treated as separate participants.

6.4.3 The impact of stress-resilience group, sex and age group on cortisol

Table 6.3 shows the cortisol response patterns across the five time points. Cortisol responses across the BEST-C were examined using paired samples t-tests, with a Bonferroni correction applied due to multiple tests (p value/10 tests = .005), which showed a significant difference between time two and time three, $t(32) = 3.551$, $p = .001$, time two and time four, $t(32) = 4.305$, $p < .001$, and time two and time five, $t(32) = 4.310$, $p < .001$. The means showed that cortisol at time two (the anticipation period) was higher than at times three, four and five (stressor, and two recovery samples respectively).

Table 6.2

Percentages, means and standard deviations (SD) for the demographic information, life events, daily hassles and coping strategies (n = 33)

	High resilience		**Low resilience**	
	High stress	**Low stress**	**High stress**	**Low stress**
Sex in %:				
Boys	62.5	80	44.4	33.3
Girls	37.5	20	55.6	66.7
Age in years	8.75 (1.75)	9.00 (1.49)	9.00 (1.23)	8.83 (1.47)
Ethnicity in %:				
White British	87.5	70	100	72
White British/European	12.5	10	N/A	14
White British/Other	N/A	20	N/A	14
Parent four-factor SES score	51.25 (11.74)	53.10 (7.89)	57.78 (9.70)	50.58 (3.65)
Body Mass Index (BMI)	9.96 (1.73)	11.05 (1.87)	10.58 (2.01)	10.65 (2.14)
Life events score	218.63(36.45)	80.10 (37.63)	256.67 (48.15)	62.50 (41.86)
Everyday hassles score	45.38 (17.19)	30.80 (16.67)	44.11 (17.88)	40.83 (21.44)
Frequency of coping style:				
Problem-focussed	3.38 (0.74)	2.10 (1.20)	1.89 (1.17)	2.50 (1.64)
Emotion-focussed	3.13 (0.84)	3.70 (1.42)	2.78 (1.39)	3.00 (1.10)
Avoidant	2.00 (0.93)	1.70 (0.95)	1.33 (0.87)	1.83 (1.17)
Efficacy of coping style:				
Problem-focussed	4.75 (1.28)	2.80 (2.10)	2.78 (2.22)	3.83 (2.79)
Emotion-focussed	2.88 (2.10)	2.70 (1.89)	2.44 (1.24)	3.33 (2.34)
Avoidant	2.75 (1.75)	1.80 (1.68)	1.33 (1.33)	1.50 (1.23)

Table 6.3

Cortisol means across the stress test

	Mean cortisol level (nmol/l)	**Standard deviation**
Time 1 (baseline)	2.90	1.58
Time 2 (anticipation)	3.21	2.10
Time 3 (reactivity)	2.35	1.60
Time 4 (Recovery 1)	2.15	1.43
Time 5 (Recovery 2)	2.09	1.57

A MANOVA and follow-up ANOVAs showed a significant main effect of sex but no significant effects of stress-resilience group or age group. Using Pillai's trace, there was a significant effect of sex on cortisol levels, $V = .861$, $F(5, 5) = 6.21$, $p = .033$, $\eta^2_p = .861$. Follow-up paired t-tests (with the file split by sex and a Bonferroni correction to $p = .005$) showed significant differences between time two and time four ($p = .002$) and time two and time five ($p<.001$) for boys only. Means showed that boys had higher cortisol at time two (anticipation period) than at times four and five (recovery period).

There was a significant interaction between sex and age group for cortisol at time one, $F(1, 33) = 8.38$, $p = .018$, $\eta^2_p = .482$, however a follow-up independent t-test for sex (with the file split by age) found that there were no significant differences in cortisol levels between age groups. Post-hoc tests also found no age group differences.

There was a significant difference between stress-resilience groups for cortisol at time four between the high resilience/high stress and high resilience/low stress groups ($p = .044$, 95% CI .01 to .88). Means show that cortisol was highest in the high resilience/low stress group, suggesting that in high resilience groups experience of stress was associated with lower cortisol in the recovery period. Figure 6.3 shows the cortisol response patterns across the five time points in the four stress-resilience groups.

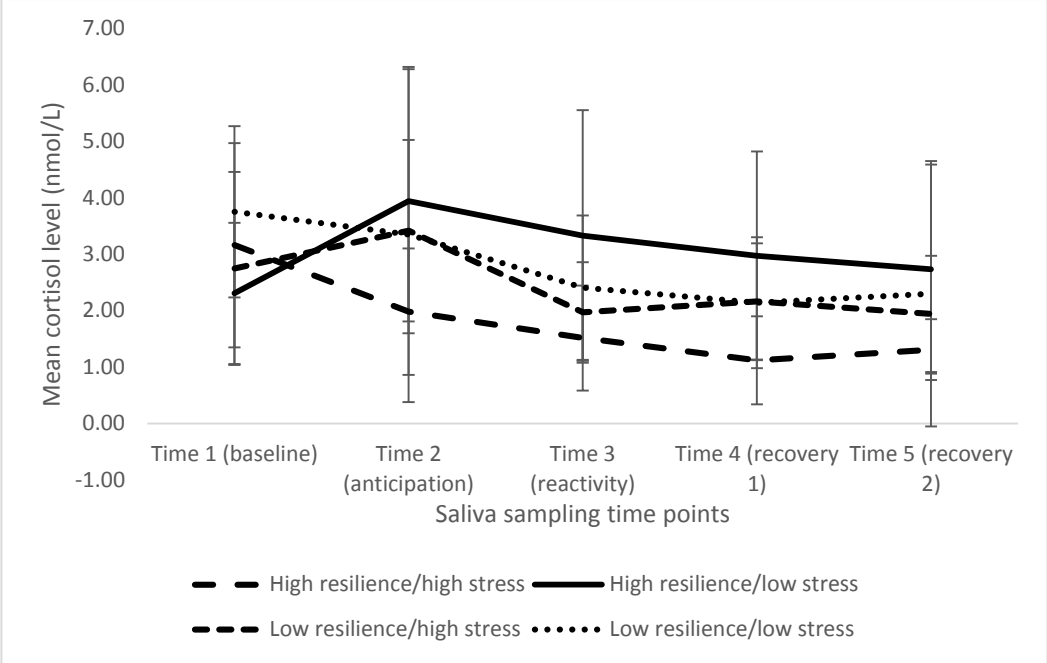


Figure 6.3. Cortisol levels across the five time points for the four stress-resilience groups. *Note*. Error bars represent standard deviations.

6.4.4 The impact of stress-resilience group, sex and age group on heart rate

Figure 6.4 shows the heart rate response patterns across the three time points in the four stress-resilience groups. The two high resilience groups show the expected pattern of response, which is an increase in heart rate in response to the stressor and decrease in the recovery period. However, the low resilience group showed a continued increase in heart rate from the stressor into the recovery period, perhaps indicating continued stress arousal. Paired samples t-tests, with a Bonferroni correction applied due to multiple tests (*p* value/three tests = .017), showed a significant difference between heart rate at time one and time two, $t(32) = -2.818$, $p = .008$, and heart rate at time one and time three, $t(32) = -3.218$, $p = .003$, but no significant difference between heart rate at time two and time three.

A MANOVA found no significant main effects or interactions for stress-resilience group, sex or age group on heart rate across the three time points. Paired samples t-tests (with the file split by age group) revealed a significant difference between heart rate at time one and time two for nine year olds, $t(6) = -10.42$, $p<.001$, with higher heart rate at time two (during the stressor) than at time one (the anticipation period).

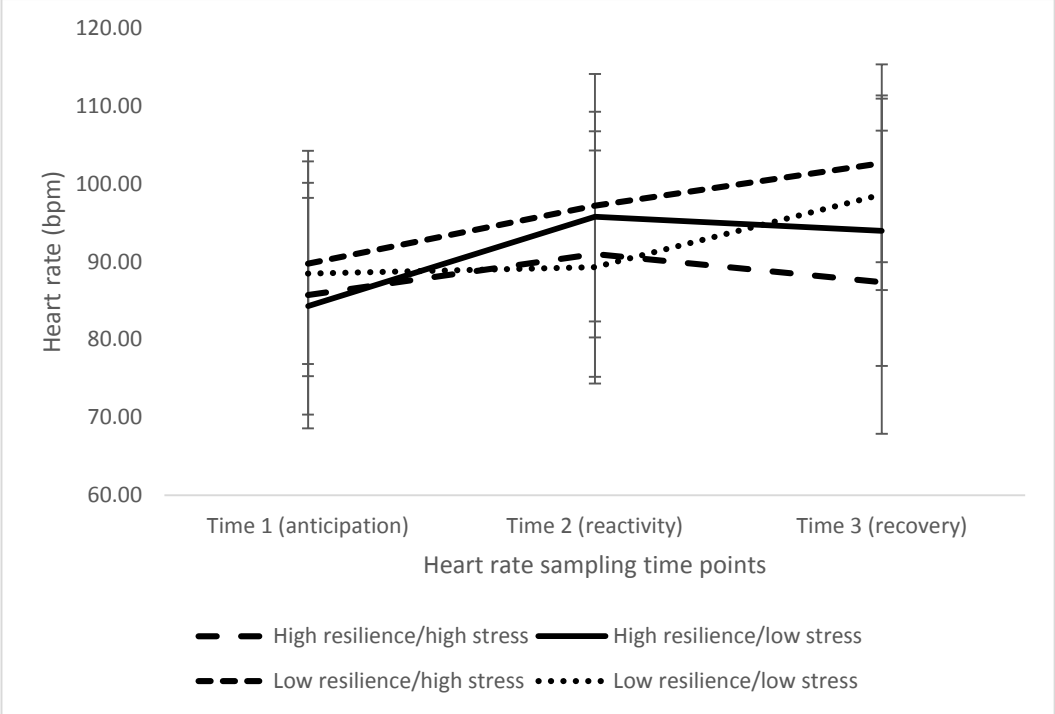


Figure 6.4. Heart rate values across the three time points for the four stress-resilience groups (y-axis values start from 60). *Note*. Error bars represent standard deviations.

6.4.5 The impact of life events, daily hassles and coping strategies

Bivariate correlations demonstrated that life events and cortisol levels at the five time points were not correlated, however daily hassles were significantly negatively correlated with cortisol at time four (r = -.363, p =.038) suggesting that participants with more daily hassles occurring in the last month had lower cortisol at time four (in the recovery period). A one-way ANOVA comparing the number of life events and daily hassles in each of the four stress-resilience groups was significant for life events, $F(3,32)$ = 45.52, p<.001, but not for daily hassles (p = .305).

Post-hoc tests for life events found significant differences between the number of life events reported by participants in the high resilience/high stress group and the high resilience/low stress group (p<.001), the high resilience/high stress and the low resilience/low stress groups (p<.001), the high resilience/low stress and the low resilience/high stress group (p<.001), the low resilience/high stress and the low resilience/low stress (p<.001). Table 6.2 (in section 6.4.3) displays the means for the life events scores for each group, and it can be seen that the highest number of life events are reported by the low resilience/high stress group, followed by the high resilience/high stress

group, the high resilience/low stress group, with the lowest number of life events reported by the low resilience/low stress group.

Bivariate correlations were conducted between the frequency and efficacy of the three coping strategies and cortisol levels and are presented in Table 6.4. Frequency of problem-focussed coping was significantly negatively correlated with cortisol at time two (r = -.400, p =.021), time four (r = -.394, p =.023), and time five (r = -.406, p =.019), suggesting that participants who used problem-focussed coping strategies more frequently had lower cortisol during the anticipation and recovery periods. Frequency of emotion-focussed coping was not found to significantly correlate with cortisol, however frequency of avoidant coping was significantly positively correlated with cortisol at time two (r = .360, p =.040) signifying that more frequent use of avoidant coping was associated with higher cortisol during the anticipation period. Efficacy of the three coping strategies was not correlated with cortisol levels. A one-way ANOVA comparing the frequency of the three coping strategies in each of the four stress-resilience groups was not significant for problem-focussed (p = .074), emotion-focussed (p = .429), or avoidant coping (p = .542). Similarly, a one-way ANOVA comparing the efficacy of the three coping strategies in the four stress-resilience groups was not significant for problem-focussed (p = .190), emotion-focussed (p = .838), or avoidant coping (p = .275).

Table 6.4

Correlations between coping and cortisol levels

	Time 1 (baseline)	**Time 2 (anticipation)**	**Time 3 (reactivity)**	**Time 4 (recovery 1)**	**Time 5 (recovery 2)**
Frequency of coping types:					
Problem-focussed	0.02	-0.40*	-0.14	-0.39*	-0.41*
Emotion-focussed	-0.23	0.21	0.25	0.06	-0.02
Avoidant	-0.04	0.36*	0.12	-0.09	-0.01
Efficacy of coping types:					
Problem-focussed	0.07	-0.19	0.05	-0.23	-0.12
Emotion-focussed	0.04	0.28	0.26	-0.06	-0.01
Avoidant	0.01	0.24	-0.05	-0.21	0.09

Note. * = p<.05

6.4.6 The interview as a manipulation check

The brief interview after the BEST-C was used as a manipulation check; in study one it corroborated the cortisol data and it enabled the researcher to confirm that children had perceived the BEST-C task as stressful. Due to the dual purpose of the interviews they were analysed both qualitatively and quantitatively in study one. However, in the present study the BEST-C did not increase cortisol levels as expected (although there was an increase during the anticipation period) therefore the interviews served a different purpose: to help elucidate the reasons why the BEST-C did not induce a cortisol response in the present study.

The majority of participants mentioned feeling scared or worried during the task, however, this was not reflected in their cortisol levels. A possible explanation for the low levels of cortisol, when they were expected to be at their peak, is social support. In the present study the participants had met and been interviewed by the researcher prior to completing the BEST-C, in contrast to study one in which the BEST-C was the first time participants met the researcher. It was not thought that prior contact with the researcher would be problematic for the outcome of the stress test, however in the interviews, when children were asked how they coped with the task, many of them referred to the presence of the researcher as helpful. References to the researcher as social support in the interviews include one participant commenting that they coped with the task by looking at the researcher (C16), others pretended the researcher was the only one present during the task so it was more like a conversation (C20, C21), and some said that they did not feel nervous because they knew the researcher (C14, C22). Several participants mentioned that it helped that there were only two people in the audience suggesting that they did not count the researcher as part of the stress panel (C10, C16, C20, C30, C31). Researcher presence was clearly counter-productive to the outcome of the stress test due to prior contact during the interviews.

6.4.7 Characteristics of the four stress-resilience groups

When looking at the tables created for the 18 highly resilient individuals (for example see Figure 6.2) it is clear that participants who were coded as resilient had a similar range of characteristics. Almost all resilient individuals used a combination of individual and collective coping strategies (conceptualised as internal and external resources by Radnitz and Tiersky, 2007). Individual coping strategies included personal characteristics and approaches that the children chose to use themselves that did not

require input or encouragement from others, such as positive reframing of situations, patience, and personality features such as a calm and even temperament. Collective coping strategies included approaches that relied on input from other people such as talking to parents, siblings, friends and teachers with the view that talking was a way of unburdening themselves and releasing problems. Most of the resilient participants placed a large emphasis on moving on from stress rather than dwelling on it whereas in the 15 low resilience individuals there were many more references to dwelling on problems and struggling to move on from stressful situations.

Personality characteristics were also mentioned by the low resilience individuals although the characteristics mentioned were distinctly different from those referred to by highly resilient participants. These included being easily upset, having a fiery temperament, lack of control over emotions and behaviour, low self-esteem, and dwelling on problems. The low resilience participants often reported not wanting to talk about their problems and isolating themselves from social support; essentially the opposite of the social support seeking exhibited by the highly resilient individuals. The distinctions between the high and low resilience participants in the sample emphasised some of the key psychosocial factors in resilience, namely the importance of utilising social support and also developing individual coping resources so that successful coping is not dependent upon others alone.

6.5 Discussion

6.5.1 Physiological and psychological responses to the BEST-C

Contrary to study one and the hypothesis of the present study, there was no significant increase in cortisol in response to the BEST-C. However, this does not mean that the task was not stressful as the majority of participants (67%) reported that they found that task stressful or worrying and commented on their feelings of relief post-task. This suggests that the task was effective at inducing feelings of stress, even though this fear did not translate into a physiological response. Similarly, in line with study one, there was an increase in cortisol in anticipation of the task, suggesting that the thought of the stressor was a stressful prospect.

As in study one, sex differences were found in the recovery period, with boys displaying higher levels of cortisol than girls. These heightened cortisol levels were also found in the anticipation period in the present study. Differences were also found regarding the prevalence of daily hassles, with participants who experienced higher levels of daily

hassles exhibiting lower levels of cortisol in the recovery period. Higher occurrence of problem-focussed coping was also linked to lower cortisol levels at baseline and during recovery, and more frequent use of avoidant coping was associated with higher cortisol in the anticipation period.

6.5.2 Social support as a protective factor in coping with the BEST-C

The lack of a physiological stress response to the BEST-C has been explained by the presence of the researcher acting as social support due to the relationship and rapport established between participants and the researcher in study two. In study one the participant only met the researcher twenty minutes before completing the BEST-C but in study three the participants had already met the researcher during the interviews in study two usually for an hour in their home (a familiar surrounding). Therefore, when participants completed the BEST-C their relationship to the research was as a stranger (study one) versus an acquaintance (study three).

As previously discussed, during the brief interviews the majority of the participants mentioned that they found the task stressful but many of them also mentioned that they were able to cope with the task because of the social support provided by the researcher's presence. Although the audience responded negatively and the researcher responded to participants during the stress test in a neutral way (as in study one) the researcher's presence alone was enough to reduce participants' worries and lower their stress response. Participants remarked on how looking at the researcher or directing their focus towards them rather than at the child panel was enough to distract them from the stress-inducing audience. Some social stress testing research with adults has compared the regular TSST paradigm with a friendly version (the f-TSST) in which the audience were friendly and encouraging towards the participant during the task (Wiemers et al., 2013). The f-TSST did not increase cortisol in adults, whereas the regular TSST induced SET and increased cortisol, therefore acting positively towards participants can be an effective stress buffer. Although the researcher acted in a neutral manner during the task, their previous friendliness towards the participants during the interviews may have been focused on by the participants during the BEST-C.

6.5.3 Acute stress responses differ based on stress experience and resilience

Using the study two interviews to group the participants based on their experience of stress (high/low) and resilience factors (high/low) was an effective way to combine

information about their overall stress-resilience with data on how they responded to an acute stressor. In Figure 6.3 the different patterns of cortisol response can be seen between the four stress-resilience groups. Focussing first on the children who displayed high levels of resilience, the children who had experienced high levels of stress displayed the lowest levels of cortisol throughout the time points, suggesting that their resilient character and experiences dealing with stress made them better able to cope with an acute stressor such as the BEST-C. The highly resilient children who had experienced lower levels of stress in the past year showed the highest levels of cortisol throughout the task, further supporting the suggestion that experience of stress can be beneficial when it comes to dealing with a social stressor. The two low resilience groups showed similar patterns across the time points indicating that, in the cortisol responses of low resilience individuals, experience of stress was not a distinguishing factor.

The findings from the present study support the wider literature surrounding resilience in children, and its impact on stress responses and coping. D'Imperio et al. (2000) distinguished between resilient and stress-affected adolescents in order to better understand and differentiate between protective resources which can be used to buffer stress responses. Similarly, research has considered how personality factors such as temperament can enhance stress resilience (Smith & Prior, 1995; Yendork & Somhlaba, 2015) and affect how children respond to social stressors such as the TSST (Childs et al., 2014; Tyrka et al., 2007). Interventions have been designed to increase stress resilience based on psychosocial factors such as social support and encouraging characteristics such as meaning-making, creativity and social skills (Waaktaar et al., 2004).

6.5.4 The inclusion of a second physiological measure of stress

The present study built on the foundations of study one; part of this advancement included the addition of a second physiological measure of stress: heart rate. When heart rate between the four stress-resilience groups was compared both high resilience groups showed the expected response of an increase in heart rate during the stressor and a decrease in the recovery period. The low resilience groups also showed an increase in heart rate in response to the BEST-C but then continued to have elevated heart rate during the recovery period, suggesting that children with lower levels of resilience were less quick to adapt once a stressor had ended. However these findings should be taken with caution due to the methodological difficulties in assessing heart rate in children (discussed in the next section) (Strahler et al., 2010).

6.5.5 Strengths and limitations

This study was able to build on study one by using the aspects of the study that were successful, such as the BEST-C protocol, and address any issues raised, for example taking a baseline measure the day before testing rather than during the anticipation period. These aspects ensured that the study procedure was stringent and replicable. The addition of a second physiological measure of stress permitted the study to move beyond mere replication into further advancement of the social stress testing literature. Coding the in-depth interviews from study two enabled a deeper assessment and understanding of children's stress responses in light of their experiences of stress, and the resilience and vulnerability characteristics they possessed. The coding was theoretically sound as it was based on a framework used successfully with adolescents (D'Imperio et al., 2000; Masten, 2014; Smith & Prior, 1995).

Nevertheless, the study was not without its weaknesses. Unfortunately, the main finding from study one, that the BEST-C reliably induced a cortisol response, was not supported. However, this finding has been explained in reference to the impact of social support on children's stress reactivity, an issue that will be expanded upon further in the next chapter. Although an unexpected outcome, the researcher acting as a form of social support inadvertently advanced the research by implementing further audience manipulation.

A methodological issue with the present study concerns how the heart rate was measured. As heart rate was measured for half an hour every effort was made to ensure that conditions were consistent throughout the entire period of measurement, however, due to the nature of laboratory stress testing, this was not always possible. For example children were seated while their heart rate was measured during the anticipation and recovery periods whereas they were stood up in front of the audience during the stressor period (as this is part of standard stress testing protocol). They also walked between rooms twice (between the waiting room and the stress lab before the BEST-C and to the debrief room after the task). Both standing up and walking around could have elevated children's heart rate therefore the heart rate findings must be treated with caution (Strahler et al., 2010).

6.5.7 Conclusions

The present study replicated the BEST-C protocol designed in study one using a population of children for whom data had been collected regarding their stress experience,

resilience and vulnerability characteristics. This method of data collection and mixed methods analysis allowed for an in-depth investigation of children's wider experiences of stress and how this related to their responses to an acute stressor. It was intended that future research using the BEST-C would continue to manipulate the audience in order to better understand the mechanisms of social stress testing in children. Therefore, this study has gone forward in enacting this aim and has highlighted the subtle importance of social support in children's coping with acute social stress.

Chapter seven: Overall discussion

7.1 Chapter overview

This chapter will provide a brief overview of the main findings from each of the three studies in this programme of research. It will then integrate and discuss these findings in relation to the three research questions outlined in chapter one, regarding the impact of stress testing, children's experiences of stress, and the psychosocial processes which impact resilience. These overall findings will also be related to the relevant theories from chapter two. Strengths and limitations of the overall research programme will be outlined and potential applications and recommendations for future research discussed.

7.2 Study one findings

The main finding from study one was that the BEST-C was a meaningful task for inducing a stress response in children aged seven to 11 years. The novel panel manipulations made to the standard Trier Social Stress Test (TSST) paradigm of using a pre-recorded peer-matched audience were found to be successful in eliciting a physiological and psychological response measured using salivary cortisol samples and self-reported stress respectively. A significant increase in cortisol was found between the proxy baseline measure and the sample taken 20 minutes post-stressor (the reactivity period). Most participants showed a decline in cortisol in the post-stressor recovery period, however boys generally took longer to recover from the BEST-C than girls (i.e. for their cortisol levels to return to baseline). More experience of stressful life events in the past year was linked to lower levels of cortisol in the reactivity and recovery phases, suggesting that those who have previously encountered and coped with stress were better able to cope with an acute social stressor. Children who used emotion-focussed coping more frequently were found to have lower cortisol at baseline and recovery.

This study also found three distinct patterns of response to the BEST-C suggesting that children in this age group do not all respond to stress in the same way. These patterns emerged when the self-reported subjective experiences of the stressor were mapped against the cortisol responses. The three patterns included: i) participants who self-reported in the interview that they did not find the test stressful and did not show an increase in cortisol response to the stress test; ii) participants who reported that they found the task stressful but felt better straight afterwards showed increased cortisol in the reactivity period and a cortisol decrease in the recovery period, and iii) participants who reported feeling stressed

in response to the task and continued to feel stressed afterwards showed an increase in cortisol during the reactivity period and sustained high cortisol in the recovery period.

7.3 Study two findings

In study two four themes were found in the analysis: navigating the social minefield, pressure to thrive in the modern world, fear of the unknown, and learning life's lessons. The first theme highlighted the impact and importance of children's social networks. These networks were both a positive factor in terms of social support and a negative factor in relation to the stress that can be experienced when social relationships go wrong, e.g. bullying by peers. The second theme found that pressure for children to do well came from multiple sources, for example school, extra-curricular activities and increasing levels of responsibility. This pressure was found to be both self-imposed and stimulated by parents and teachers and had both negative and positive outcomes. For example, negatively impacting self-esteem but also increasing self-worth after hard-won achievements for some of the participants. The third theme, fear of the unknown, demonstrated that children were better able to cope with familiar stressors than novel or unknown stressors. The fourth and final theme, learning life's lessons, emphasised how children could learn a lot about stress and coping from stressful experiences; knowledge which could then be applied to coping with future stressors.

7.4 Study three findings

The final study in this programme of research found no significant increase in cortisol in response to the BEST-C, which can be explained by the differences between the children's relationship with the researcher in study one and in study three. In study one the participant met the researcher immediately prior to completing the BEST-C (so they were essentially a stranger) whereas in study three the participants met the researcher and developed a rapport (during the interviews in study two). Therefore, when the participants in study three completed the BEST-C they reported that they found the researcher's presence during the task to be a source of social support.

A significant increase in cortisol was found in the anticipation period prior to participants completing the BEST-C, suggesting that the thought of the stressor was an intimidating and stressful prospect. This is consistent with the finding from study two that children are more stressed by novel experiences (i.e. see fear of the unknown theme). Sex differences were found in the anticipation and recovery periods, with boys having higher

cortisol than girls at these times. Higher levels of daily hassles in the past month was linked to lower levels of cortisol in the recovery period, suggesting that those who had experienced recent minor stressors were better able to cope with an acute social stress test. More frequent use of problem-focussed coping was linked to lower cortisol levels at baseline and during recovery, and a higher occurrence of avoidant coping was associated with higher cortisol in the anticipation period.

7.5 Overall findings

The following section will combine and discuss the main findings from each of the three studies in relation to the three research questions outlined in the introduction in chapter one. The research questions this thesis aimed to investigate were:

- What is the effect of an acute social stressor on children's stress responses?
- What are children's experiences of stress and early life adversity?
- What psychosocial factors and individual differences are involved in developing resilience to stress in children?

7.5.1 The impact of an acute social stressor on children's stress responses

Study one and study three applied the BEST-C to two different groups of seven to 11 year olds. In study one cortisol was found to increase in response to the BEST-C demonstrating its effectiveness as a social stress test for children. However, in study three cortisol did not increase in response to the stress test. The explanation offered in this thesis for the difference in responses between studies is that the researcher inadvertently became a source of social support to the participants throughout the task; a finding that has been discussed and expanded upon in light of relevant research in chapter six. It was hypothesised that the findings of study three would replicate the findings of study one and provide further support for the BEST-C as a meaningful social stressor for children. Despite the findings not being replicated there is still evidence that this stress test is an effective stressor: in the interviews the majority of participants self-reported that they found the task stressful and worrying (67% in study three versus 84% in study one). Similarly, many participants in study three commented on feeling relieved once the task was over. This self-report data suggests that the task was effective at inducing a perceived stress response however the impact of social support (i.e. the researcher) may have prevented this perceived stress being translated into a biological stress response.

As discussed in earlier chapters the findings from laboratory based social stress testing with children have been inconclusive (Gunnar, Talge, & Herrera, 2009). The majority of research has suggested that children show an increase in cortisol in response to acute social stress (Buske-Kirschbaum et al., 1997; Gordis et al., 2006; Yim et al., 2010), however other studies have also shown little or no stress response (Dorn et al., 2003; Westenberg et al., 2009). To better examine children's stress responses a more meaningful task for children was developed in study one using a pre-recorded child audience. The physiological data in study one and self-report data in study three supports the research that demonstrated that children as young as seven years old show an increase in cortisol in response to stress.

7.5.1.1 Stress anticipation effect

The physiological data in study one and study three both demonstrated an increase in cortisol during the anticipation period before the task. In the first study the baseline sample was taken ten minutes prior to the stressor and this sample was found to be extremely high. Participants also commented during the brief interview that they were feeling nervous and worried about the task, suggesting that the time immediately prior to the task acts as an anticipatory stress period. This study one finding was replicated in study three as levels of cortisol were significantly higher in this period than during the stressor reactivity and recovery times, suggesting a powerful anticipation effect.

An anticipation effect has been found in other stress testing research, with anticipation of a stressor leading to higher CAR as well as stress reactivity to the task (Wetherell et al., 2015). Sumter, Bokhorst, Miers, Van Pelt, and Westenberg (2010) found that the highest cortisol levels in their sample of adolescents were in the anticipation phase rather than in the reactivity period. Similarly, two studies found that baseline levels were higher than recovery levels of cortisol suggesting that participants began the task with cortisol already heightened (van den Bos et al., 2014; Westenberg et al., 2009). This anticipatory effect has been used to explain why some studies have not found an increase in cortisol from baseline (if this sample is taken during the anticipation phase) and the reactivity phase (Sumter et al., 2010). To avoid baseline samples being taken during the anticipation phase Engert et al. (2013) suggests taking the sample at least 15 minutes before the stress test as inter-individual differences in peak response times can impact anticipation responses as well as stress reactivity. A longer pre-stressor period would be

better suited to capturing participants' varying peak responses and therefore reduce interference between the anticipation and reactivity stress response samples.

7.5.1.2 Sex differences in responses to stress

In study one sex differences were found in the recovery period, with boys exhibiting higher levels of cortisol post-stress than girls, suggesting that girls recovered more quickly from the social stress test. Similar findings arose in study three, with boys displaying higher cortisol in both recovery samples and also during the anticipation period. The findings from study three corroborate the results from study one regarding cortisol levels during the recovery phase. The study three findings also expand upon study one and previous research by suggesting that there were also sex differences in anticipation to the stressor. These findings correspond to other stress testing research which has found that male adolescents had a stronger response to the TSST and higher cortisol than females (Lu, Tao, Hou, & Sun, 2014).

7.5.1.3 Characteristics of stress

It is important to consider the four key characteristics of stress outlined in chapter two: SET, controllability, predictability and timing in light of the findings of the present research. The theory of SET was demonstrated in all three studies in this programme of research, most notably in the increased cortisol in response to the task in study one and the post-stressor interviews carried out in study's one and three. One of the themes found in the study one interviews was particularly relevant to SET: the presence of an audience. Many of the participants remarked on how the audience's presence and behaviour made them feel worried and stressed during the task and how this was a central feature of the stress experience for them. Several children remarked on how this behaviour made them feel negatively about themselves evidencing the very definition of SET, i.e. threat to one's social self or status (Dickerson et al., 2009; Dickerson & Kemeny, 2004). Similarly, in study two, the theme 'navigating the social minefield' encompassed the idea that social relationships can be a source of stress, highlighting the importance of examining social stressors.

Controllability has been reported to be an integral feature of social stress testing in previous research (Haan, 1977, 1993; Rudolph, 2008). This finding was supported in the present research, particularly in study one and study three, which utilised an uncontrollable social stressor. As participants were unable to control the task (i.e. the BEST-C) they are

likely to have resorted to trying to control their emotional response to the task. This marks the distinction between problem-focussed and emotion-focussed coping outlined in chapter two: focusing on changing the situation versus changing one's emotional responses to the stressor. The link between coping and control was highlighted by Kraag et al. (2006) who found that higher perceived control was associated with better coping. Although data was not collected about how participants coped with the BEST-C, information was gathered on their previous usage of coping strategies. This data suggested that past use of emotion-focussed coping was associated with lower cortisol in study one and problem-focussed coping was correlated with lower cortisol in study three. The key difference between these two studies was the provision of social support, suggesting that in the absence of social support emotion-focussed coping was most beneficial. However, this conclusion must be viewed with caution as the coping data related to coping with past stressors, not the stress elicited by the BEST-C.

Predictability featured strongly in children's narratives in the study two interviews. The fear of the unknown theme highlighted how children were better able to cope with familiar or predictable situations whereas unknown or unexpected experiences were more difficult to cope with. This finding was supported by study three in which children reported being more upset by novel experiences (in the form of anticipation to the BEST-C) than predictable ones. Children who had reported prior experience facing similar social stressors, such as public speaking, were more likely to be part of the no stress response group in study one.

As noted in chapter two the timing and duration of a stressor impacts the stress response (Lupien et al., 2009; Miller et al., 2009). The relevance of timing was highlighted in a theme from the analysis of the study one interviews, which found that emotions towards the BEST-C were time and task dependent. The majority of participants reported feeling better once the task was complete and some remarked on feeling more comfortable during the task once they had had some time to get used to it; this links to how predictability can be comforting (as discussed above).

7.5.1.4 Alternative explanation of the findings

The conclusions in this programme of research have been based on the interpretation that lower levels of cortisol during the recovery phase after completing the BEST-C are a sign of adaptation and that higher levels of cortisol are maladaptive. In the stress testing literature this is the predominant interpretation of the changes in cortisol in

response to a stressor. Higher cortisol indicates a stronger stress response than lower levels of cortisol and continued elevation of cortisol is a negative outcome. However, there are other interpretations within the wider stress literature, in particular the research investigating hyporeactivity to stress. As described in chapter two hyporesponsiveness to stress involves a blunted cortisol response indicative of a lack of activation of the stress response systems, which is often viewed as maladaptive (Dickerson et al., 2009). Hyporesponsiveness to stress can occur as a result of repeated activation of the stress response system, i.e. allostatic load, which could be due to chronic or recurring stressful life experiences. This over-activation may lead individuals who have experienced major life stress to fail to respond adaptively to future threats. However, hyporeactivity can also occur for reasons other than over-activation, such as in certain phases of development, e.g. Gunnar & Quevedo (2007) found that hyporeactivity extended from infancy throughout most of childhood.

It is important to consider that there are alternative explanations for lower cortisol levels, however these interpretations do not provide adequate explanations of the results of the present research. The first explanation would suggest that the finding that more stressful life events (in study one) and more daily hassles (in study three) were associated with lower cortisol in the recovery period was due to a lack of an appropriate stress response, i.e. stress hyporeactivity. However, this interpretation can be refuted because the majority of participants showed the expected elevation in cortisol in response to the stressor, so the variation in cortisol levels was typically found in the recovery period. If the participants with lower cortisol were truly exhibiting a blunted response then they would not have shown an increase at any point across the whole task; their cortisol levels would have stayed low throughout, however this was not the case in the present study. For the same reason the second interpretation of normal childhood hyporeactivity can also be dismissed as an explanation for the findings in the current research, as most children did show an increase in cortisol. To determine whether children are showing evidence of positive adaptation, maladaptive hyporeactivity or normal levels of childhood hyporeactivity in future research, a longitudinal approach would need to be taken to fully assess children's experiences of chronic or repeated stress, and how their levels changed as they developed.

7.5.2 Children's experiences of early life adversity and stress

In study one and study two participants completed questionnaires about their experiences of stressful life events in the past year and daily hassles in the past month, with the interviews in study two investigating general life stress in more depth. As discussed earlier in this chapter, participants who had experienced more stressful life events were found to have lower levels of cortisol in the recovery period in study one. Similarly, in study three children who had higher levels of daily hassles had lower cortisol during the recovery period. These findings substantiate the work of some of the key researchers of early life adversity who have found that experience of stressful events, ranging from bullying to maltreatment, were associated with subsequently lower levels of stress reactivity (Knack et al., 2011; Lovallo, 2013; McLaughlin et al., 2015; Trickett et al., 2014).

In the interviews in study two a wide range of stressful and adverse experiences were discussed by participants and their parents. These adverse experiences included prenatal stress, birth complications, neonatal and pre-school health problems; and school related adversity, such as bullying, changing schools, friendship dynamics, and trouble with schoolwork. Family based stress was also a major component of children's stress experiences, for example parents working away from home, sibling arguments, and changes such as moving house, parental separation or divorce. Similarly, extra-curricular stress, such as not making a sports team and pressure to do well; as well as more general worries and fears, for example trouble sleeping, rumination about past stress, and fears of not being good enough, also featured. Some of these experiences became part of the four themes developed during the analysis of study two. The themes incorporated the stress caused by the dynamic and changeable social relationships children have with friends, family and teachers (theme one: navigating the social minefield), as well as the pressure to do well that children experience from multiple sources and in multiple areas of their lives (theme two: pressure to thrive in the modern world). The third theme (fear of the unknown) focussed on the differences in worrying and coping between familiar and novel stress experiences. The fourth theme (learning life's lessons) placed an emphasis on what children could learn from the stressful situations they had experienced, both in terms of learning about adversity and how to cope with it.

As discussed in chapter two, the literature regarding the impact of early life adversity is divided as to whether it has a positive or negative effect on resilience, however it is generally accepted that experience of minor stress can be beneficial and major

stressors can lead to stress vulnerability (Shonkoff et al., 2009). Yet, major adversity does not always lead to stress vulnerability; some children with experience of severe life stressors can also develop resilience, an area of research which has garnered more attention over the last four decades (Masten, 2014). According to definitions of resilience, it is a capacity which can be developed as a result of interactions between individual's and their environment (Egeland et al., 1993), suggesting that both time and experience of stress can be beneficial for increased resilience. There is also a burgeoning literature regarding post-traumatic growth, which highlights the positive psychological changes that can occur after experiences of stress and adversity (Tedeschi et al., 1998). For example Duran (2013) reviewed 35 studies (20 quantitative, 12 qualitative, and three mixed methods studies) and created a narrative synthesis which elicited five themes regarding post-traumatic growth experienced by survivors of childhood cancer.

In study three, when children were categorised into groups based on high/low stress experience and high/low resilience there were eight participants (24% of the sample) who had experienced high levels of stress and displayed high levels of resilience and nine participants (26% of the sample) who had also experienced high levels of stress but displayed low levels of resilience. This finding indicates that stress experience alone does not determine the development of resilience, as some of the children who had experienced high levels of adversity were categorised as resilient. The differences between these groups and reasons for their development of resilience or vulnerability have been discussed above (and in more detail in chapter six).

The development of resilience in spite of adversity supports the notion that stress can be good for resilience and have a 'steeling effect' (Forns et al., 2014), thereby reducing the chances of negative outcomes from future stress. This steeling effect has been incorporated into the stress-inoculation hypothesis which suggests that stress can have positive benefits for resilience (Gunnar, Frenn, Wewerka, & Van Ryzin, 2009). As discussed in relation to the themes from study two, experience of coping with everyday stress and more major life adversity can lead to improved coping ability in the future (Tronick, 2006).

7.5.3 Psychosocial processes involved in the development of resilience in children

This section will outline some of the psychosocial factors found to be associated with resilience in the present programme of research, and how these findings relate to the wider resilience research discussed in the literature review chapter. The literature relating

to four psychosocial factors were discussed in chapter two and will be drawn on in this chapter. Experiences of early life stress have been discussed in the previous section, therefore this section will focus on personality, social support, coping strategies, and cognitive skills. Demographic factors were discussed in chapter two in relation to their impact on stress but not in relation to health or resilience. Factors such as age, sex and pubertal development will not be discussed in this section as relevant age and sex differences in response to the BEST-C have already been summarised and pubertal development was not measured in the present programme of research.

7.5.3.1 Individual differences

A number of personality factors emerged in the study two interviews which had a positive or negative impact on participants' levels of resilience. Being patient and having a calm and even temperament were linked to higher resilience, as was the ability to move on from problems rather than dwell on them. Lower resilience was associated with being easily upset, having a fiery temperament, low self-esteem, and dwelling on problems.

The temperament factors such as having a calm and even temperament support the research of Masten (2014) and Werner and Smith (1992) who found that being easy-going and agreeable were linked to better outcomes, including resilience, for children and adolescents. Research has also linked high self-esteem with the development of resilience (Moksnes et al., 2010), a complementary finding to the present research which suggested that low self-esteem was associated with lower levels of resilience.

There is a wealth of research regarding adaptation, however there is no research that has considered the role of timing in adaptation to stress, for example how quickly people move on from their problems or experiences of stress. However, this ability to move on from problems quickly versus dwelling on problems was a key feature of the children's narratives in study two. This concept was found to be a major distinguishing feature between the children in the high and low resilience groups. Although no research has focussed specifically on this differentiation, there is some research on the topic of rumination, i.e. dwelling on problems. For example, in a study comparing depressed and non-depressed adolescents responses to the TSST, it was the adolescents who demonstrated higher levels of rumination that exhibited higher cortisol levels, and those with lower levels of rumination that displayed lower cortisol (Stewart et al., 2013). This suggests that the beliefs of participants in the present study, which suggested that moving

on from problems was much better than dwelling on them, was supported by physiological data from other research, as adolescents who ruminated less had lower cortisol responses.

7.5.3.2 Psychosocial resources: Social support, coping strategies and cognitive skills

The present research programme found that social support had an important role in stress management (study three) and resilience (study two). During the interviews in study two social support was repeatedly referred to by the high resilience individuals as a positive and helpful factor for enhancing coping and resilience. Social support from parents and peers enabled them to unburden themselves and share their problems. On the other hand, the low resilience participants did not draw on social support, preferring to isolate themselves and not discuss their problems. There was a clear divide between these two groups of participants regarding social support: either embracing it or rejecting it, and this was strongly linked to their categorisation as high or low resilience individuals.

In study three the researcher inadvertently acted as social support for the participants while they were undergoing the BEST-C task. The participants reported in the brief interviews post-stressor that they found the task stressful but that having the researcher present in the room made them feel better. Although they had only met the researcher once before, during the study two interviews, the participants and the researcher had developed a rapport which was enough for the participants to feel comforted by the researcher's presence. This is an insightful, although unintended, adaptation to the BEST-C paradigm as it advances the research in terms of the relationship between participants and their source of social support. Previous research had focussed on the impact of stranger, parent and partner support (parental support in research with children and partner support in research with adults), however the present research indicated that support from an acquaintance can also be an effective stress-buffer.

Research with adults compared cortisol levels and perceived stress in men and women in response to receiving social support from their partner, a stranger or no social support during the anticipation period before the TSST (Kirschbaum et al., 1995). Sex differences were found in relation to which level of support men and women found most effective; men showed reduced cortisol when their partner was present but women showed increase cortisol in the partner condition, suggesting that the benefits of social support can be sex specific. Research has also investigated the use of social support in buffering stress for children, for example receiving social support through friendship can improve children's ability to cope with stress (Graber et al., 2015). This study also found sex

differences in the benefits of social support, with a lack of close friendships having a more damaging effect on boys than on girls.

Parents are an integral feature of stress reduction for children, particularly in young infants, however parents' ability to act as a stress buffer appears to reduce as children get older. Two studies have found that parent support is less effective at reducing cortisol in response to a social stressor as children get older (Doom et al., 2015; Hostinar et al., 2015b). Some researchers have moved away from parental social support to investigate other forms of social support, for example one study has compared children's responses to the TSST-C when they were accompanied by a friendly person, a real dog or a toy dog (Beetz et al., 2011). In this study a real dog was found to be the most effective at reducing cortisol because it involved comforting physical contact, suggesting that different types of social support can have different stress-buffering benefits for children. The present programme of research provides support for the research regarding the positive impact of social support and highlights how even an adult acquaintance met only once can have a stress-buffering effect on children.

Coping strategies were a key feature of all three studies in the present programme of research, examined using questionnaires and in-depth interviews. In study one more frequent use of emotion-focussed coping was associated with lower cortisol levels at baseline and reactivity, whereas in study three more frequent use of problem-focussed coping was associated with lower cortisol at baseline and recovery. More frequent avoidant coping was linked to higher levels during the anticipation period.

The coping questionnaires did not assess children's coping with the BEST-C specifically but instead investigated how children had coped with a past stressor, to gather information about their general coping strategies. Therefore, it is not possible to conclude which coping strategies are most beneficial for stress management when children encounter a social stressor such as the BEST-C. This issue will be discussed in more detail in section 7.6 regarding strengths and weaknesses of the research. However, it can be established that children who recovered from the stressor more quickly and who were less stressed in advance of the task were more likely to use emotion or problem-focussed coping in general and that children who felt more stressed in anticipation to the task were more likely to use avoidant coping strategies.

In study two participants who used cognitive skills, such as positive reframing, were more likely to be highly resilient individuals, and those who displayed a lack of control over their emotions and behaviour were more likely to be in the low resilience

groups. The findings from study two, regarding emotional control, support the wider literature which suggests that self-regulation, i.e. the ability to control one's emotions, has a positive impact on resilience (Lavoie et al., 2014; Masten & Obradovic, 2006; Masten, 2014). Self-regulation has been found to be a particularly helpful strategy when dealing with uncontrollable stressors (Masten, 2014) and could therefore be applied to coping with acute stressors such as the BEST-C.

7.5.4 Relating the findings to theory

The findings from the present research programme can be related back to some of the theories outlined in chapter two. Theories of stress and coping such as allostatic load (McEwen & Stellar, 1993), social evaluative threat (SET; Dickerson et al., 2009; Dickerson & Kemeny, 2004; Gunnar, Talge, et al., 2009), and the transactional model of stress and coping (Lazarus & Folkman, 1984) were discussed in the literature review chapter. The four waves of resilience research were also outlined, with an emphasis placed on the fourth and current wave which uses a multilevel analysis approach to investigate resilience (Masten & Obradovic, 2006; Masten, 2007; O'Dougherty Wright et al., 2013).

There is some evidence for the theory of allostatic load in study three as different patterns of stress reactivity and recovery to the BEST-C were evident between children with high and low levels of resilience, however there were no clear distinctions between those with high and low levels of stress experience. Although the findings were not statistically significant, the children in the two low resilience groups showed continued high levels of cortisol in the recovery period whereas the children in the two high resilience groups showed reduced cortisol post-stressor. This suggests that chronic or repeated activation can lead to alterations in the recovery period after stress when participants are compared based on high/low resilience, however this distinction does not occur in relation to stress experience. Similarly, Kemeny's (2009) theory of social threat which suggested that experience of stress would lead to stronger stress reactivity, is a finding that was not supported in the present programme of research.

Elements of Haan's (1977, 1993) theory of stress were supported by the present research as novel stressors were deemed harder to cope with in study two and uncontrollable stressors in study one. The theory of SET was clearly evident in the findings from study one and study three as participants reported in the brief interviews that they felt uncomfortable with the observation of the audience and often felt negatively judged by them. SET was also supported by the physiological increase in cortisol shown in study one.

The findings from the present study were very much in line with the transactional model of stress and coping which places great emphasis on the relationship between person and environment, the appraisal of resources, and the distinction between emotion and problem-focussed coping strategies (Lazarus & Folkman, 1984). In the wider coping literature there are disagreements as to which coping strategies are most beneficial, for example some research suggests that problem-focussed coping is linked to worse outcomes in children but that the opposite is true in some of the research with adults (Aldridge & Roesch, 2007). Other researchers focus on the application of strategies used, with Thompson (1994) suggesting that consistent use of coping strategies leads to better adjustment, whereas others support the view that coping is context-dependent and therefore the best coping strategy for some stressful situations will differ from other situations (Kraag et al., 2006; Spirito et al., 1995).

A multilevel approach to resilience was taken in the present programme of research, as suggested in the fourth wave of resilience research outlined by Masten (2007). The present research used a variety of methods including qualitative interviews, and quantitative measures such as questionnaires, an experimental lab task and the collection of biological samples. These methods were collected and analysed together to provide a broader and more holistic picture of children's experience of stress and adversity, coping, and resilience.

7.5.5 Contextualising the findings in a broader social context

It is important to acknowledge the broader socio-political context in which the current research programme is placed. The participants in the sample were from a high SES background (predominantly middle class), as was the researcher collecting the data. Further, this sample was situated in an individualistic Western culture with a neoliberal approach to physical and mental health. This neoliberalism emphasises the individual's responsibility for their own health and wellbeing, an approach that has been termed 'healthism' (Crawford, 1980). The majority of scholars have a negative view of the concept of healthism as it takes responsibility away from governments and institutions and can create a competitive blame-inducing culture amongst individuals (Crawford, 1980).

In relation to the present research programme, some of the themes found in study two could be seen as being inherent in neoliberalism and healthism. For example, as discussed earlier in the thesis, the literature regarding the impact of exposure to stress is

mixed. The suggestion that stress can have beneficial effects on the individual as reflected in the theme 'learning life's lessons' could be considered a neoliberal orientation of individualisation. As outlined above, this neoliberal orientation has potential ethical implications. For example, it can have harmful effects on young people as it places the burden of responsibility for health on them, rather than on parents or schools (Burrows & Sinkinson, 2014). As this theme was found in the data, with many participants stating the importance of stress experiences for developing resilience and successful coping strategies, it could be suggested that the broader social context of neoliberalism had an impact on how children and their parent viewed stress, health and resilience. In order to not place the whole burden of responsibility for health on individuals, it is important for any future research aiming to enhance resilience to emphasise the impact that institutions, such as schools, can have on children's resilience. One way that schools could positively impact children is through resilience skills training (Burrows & Sinkinson, 2014). Doing so will help to prevent the burden of responsibility falling on children alone. However, it is also important to empower children and young people to have control over their own health and wellbeing.

A key feature of children's narratives was social support, and this is another way that institutions such as schools could contribute to improving health and wellbeing in children (Newman & Barnardo's., 2004; Ramey et al., 2015). The interviews in study two and resilience analysis conducted in study three highlighted the importance of individuals being able to draw on social support as a resource during stressful events. Schools can provide social support for both children and their parents, as well as aiding children in their development of this resiliency resource (Meijer et al., 2002; Terzian et al., 2010). School structures and cultures are also important in relation to children's experiences of stress, for example bullying and exam stress. Schools usually have policies and systems in place to support children who are bullied and the bullies themselves. However, as discussed in some of the interviews in study two, these policies do not always work in practice. Some of the bullied children in the sample (and their parents) felt very unsupported by the school. One school even blamed the child rather than consider that bullying could be an institutional problem. So although there are bullying policies in place more work may need to be done by schools to ensure these policies are enacted when needed.

Another potential way for schools to support children could be helping them to cope with exam stress. Teaching and assessment structures such as the timing of

assessments and support given to children when providing for assessments could be used to reduce exam pressure and aid coping and resilience. For some parents, the current school system was unable to provide for their children's social and emotional needs during stressful times (some of which have been outlined above). Due to this perceived deficit, several of the parents elected to send their children to forest schools. They saw the forest schools as an alternative to the traditional school structure which could better help children to develop the skills and resources needed to cope with stress.

7.6 Overall strengths and limitations

The specific strengths and weaknesses of each study have been discussed in the relevant data chapters, so this section will focus on the merits and flaws of the research project as a whole. The research programme has many strengths. The physiological and self-report data from study one and the self-report data from study three suggest that the adapted stress test (the BEST-C) developed in this programme of research was effective at inducing stress in young children. The BEST-C is a novel adaptation to the widely used TSST and TSST-C which has been found to be more effective in inducing a cortisol response than the other tasks due to its inclusion of a peer-matched audience.

Study two provided a unique discourse on children's experiences of and feelings about stress, coping and illness. This provided the research with a more holistic view of children's experiences in relation to stress, from the children's own perspectives, which has not previously been explored in relation to this topic. This study therefore provided context and background to children's responses to an acute stressor and enabled the categorisation of children into stress-resilience groups. This categorisation based on a broader understanding of children's experiences allowed for a comparison between the four stress-resilience groups, enabling the researcher to draw out differences in psychosocial factors (e.g. coping) between the high and low resilience groups. This direct comparison of multiple psychosocial factors has not been conducted before as past research has tended to focus on comparing one or two psychosocial factors and their impact on stress or resilience. The present research was able to collect data on numerous factors (in study two) along with their impact on acute stress responses to the BEST-C and resilience (in study three).

However, there are several criticisms to be made of the current research. The first issue is that the findings of study one were not replicated in study three, however this has

been attributed to the provision of social support from the researcher. The addition of social support to the standard stress testing paradigm is an important adaptation as it enhances our knowledge of how psychosocial factors such as social support can impact children's ability to cope with an acute social stressor.

A second important difference between the findings of study one and study three was the variation in cortisol levels. The individual and group means in study one were much lower than in study three (see Table 4.4. and Table 6.3 respectively). The cortisol levels were lower in study one during the baseline, reactivity and recovery periods. For example, the mean for the reactivity sample was 1.39 nmol/l in study one and 2.35 nmol/l in study three. A possible explanation for this variation in means between studies is the salivary cortisol sampling techniques used. In study one saliva was collected using Salivettes®, whereas in study three a passive drool technique was used. An explanation for the change in collection method has been detailed in chapter six, however it was not anticipated that the means would differ so much between the methods.

Some research suggests that there are no major differences between the two sampling techniques (Golatowski et al., 2013). However, further examination of the literature has yielded a number of studies that have directly compared saliva sampling methods and found the means to differ. For example, (Poll et al., 2007) found a significant difference between the salivary cortisol concentrations when collected with Salivettes® compared collection through passive drool. As in the present study, (Strazdins et al., 2005) found lower concentrations of cortisol using Salivettes® than when using passive drool. This finding suggests that in future research comparing cortisol across studies the same salivary cortisol collection method should be used consistently. This also adds to methodological findings currently topical in discussion of salivary cortisol collection.

A third criticism of the work is the sample size in study one and study three; the sample size for the qualitative research in study two was appropriate for the analytical approach taken. There were 33 participants in study one and 34 participants in study three, which is above the required sample size of 32 based on a power calculation for analysis by MANOVA. However, it would have been beneficial to have a larger sample size to ensure that the different features of the wider population were represented in the sample, thereby ensuring the findings were more generalizable to other child populations.

A fourth issue with the research was that the coping questionnaires used in study one and study three collected data on past coping strategies, which assimilated the other questionnaires investigating past life stress and daily hassles, but it would have been useful

to also measure how children coped with the BEST-C. Coping strategies were discussed in the brief interviews with participants post-stressor but it would have been beneficial to have a quantitative measure of coping as well. This would have enabled a direct comparison of coping strategies between study one and three, and further elucidated the impact of the researcher as social support in study three.

Most of the criticisms thus far have regarded study one and study three, however the final criticisms relate to study two. The in-depth interviews covered a wide range of topics such as experiences of stress, coping strategies, illness and early life adversity. This was very useful as these topics have not been discussed with children in this context before and it is important to investigate their perspectives of these topics. Nevertheless, this was perhaps too many topics to cover in one interview. Interviews can be quite long and tiring for young children (as discussed in the methodology chapter) and so fewer topics would have enabled more time to be spent on those topics leading to a deeper discussion without further fatiguing the child.

The interviews were analysed with a focus on the child's perspective of their experiences rather than a parental perspective. Although parent's accounts were also included in the development of themes and were integral to contextualising and scaffolding children's responses they were not specifically focused on in the analysis, therefore future research could reanalyse the data from study two with a parental focus. This would enable themes missed by the current analysis to be refined, for example parental pressure was part of the pressure to thrive theme; however, this theme did not delve into issues such as parenting. A possible feature of a thematic analysis of parental narratives in the data is 'helicopter' parenting, which is the over involvement of parents in children's lives (Cline & Fay, 1990). Generational coping (i.e. to what extent parents pass on their effective or ineffective coping strategies to their children) is another potential parental narrative of interest. Similarly, the health-related data from the questionnaires and interviews in study two could be analysed in conjunction with the stress and coping data to investigate the relationship between stress and illness.

A final criticism regarding the SES of the sample was briefly described in chapter five in relation to study two, but can be applied to the research programme as a whole. The participants in all three studies came from a moderate to high SES background and so important narratives could be missing from this research, i.e. the narratives of children from low SES backgrounds. As detailed in chapter two, some of the adverse early life experiences, such as poverty, are more likely to be experienced by low SES individuals.

Therefore, it would be beneficial to interview and stress test these individuals to capture their experiences of stress and investigate their levels of resilience.

The middle class nature of the sample is likely to have had an impact on the findings of all three studies. Responses to stress and coping strategies used in study one and study three could be specific to this population. Responses to stress are, in part, influenced by the environment, including, but not limited to, modelling of parental responses and stress experiences. The sample may also reflect families who value particular coping mechanisms as part of their middle class ethic and orientation.

Similarly, the themes that were found in study two, could be specific to a middle class population. For example, the theme 'pressure to thrive' focussed on the pressure that children felt to perform well in a range of areas, including school and extracurricular activities. This high level of stress regarding academic and supplementary activities is unlikely to be found in a lower SES group of participants who may have other more serious concerns to contend with, such as poverty. As outlined in Maslow's hierarchy of needs, people needs to meet their basic needs (such as physiological, safety, love and belonging needs) before they can focus on their needs related to esteem and self-actualisation (Maslow, 1954).

Some researchers have also suggested that health psychology and associated disciplines may actually favour some groups rather than others, for example, higher SES groups as opposed to low SES groups (Cohn, 2014). Healthism and its focus on individualism could certainly be viewed as a middle class phenomenon. Therefore, the conclusions of this research are perhaps not directly applicable to other SES groups who may be going through quite different experiences of stress with fewer resources to draw upon. Future research could utilise similar methods in a lower SES population.

7.7 Future research and applications

This programme of research has developed a more meaningful social stress test for children by adapting an existing measure. Therefore, further research is required to replicate the study one findings of the BEST-C to support its use in child populations. Other adaptations to the BEST-C could be created and tested in future research, for example further investigation of the social support manipulation used in study three. Future research could continue to manipulate the audience by investigating the impact of using an

older child as the panel lead compared to using an adult researcher, using groups of children as the audience, or using a child panel in adult stress testing, along with many other variations. This would enable differentiation between panel versus experimenter effects and the findings could help with the design and implementation of stress-reduction or coping strategy enhancement interventions. Panel manipulations could also include varying the way that the audience responds to participants as the two forms of negative feedback used in the present research (staring intently versus disinterest) seemed to evoke different feelings in the participants, as reported in the post-stressor interviews. Using eye-tracking equipment in future research could allow for a systematic investigation of where children look during the task (e.g. at the researcher, the audience or elsewhere) to focus in on some of the coping strategies mentioned in study one and three, such as looking at the researcher for social support.

In study one and study three sex differences were found in cortisol levels during the reactivity and recovery periods suggesting that boys and girls recover from stress in different ways, an issue which warrants further attention, particularly in regard to coping strategies. Since not all children responded to the stress test in the same way, future work is called for, focusing on individual differences, to explain differential coping with acute social stressors and its impact on the sex differences in stress recovery.

Study two is the first study to investigate the topics of stress, coping, illness, and early life adversity using a predominantly qualitative mixed-methods approach therefore there is much potential for future research investigating these topics further. The participants in study two discussed a number of different stressors ranging from minor stress to major life adversity, therefore the sample was quite heterogeneous in terms of stress experience. This heterogeneity of stress experience was appropriate for the present study because the researcher was interested in developing stress-resilience groups which were in part determined by the inclusion of participants with a range of experiences with stress. However, future research could examine more homogeneous samples of participants, for example those who had all encountered the same major stressor, such as a natural disaster or a chronic illness, to better determine resilience factors in these particular high stress groups.

Study three contributed to our knowledge of social support as a protective factor in social stress testing, as well as establishing the categorisation of stress-resilience groups as a useful way to investigate differences in stress reactivity and coping. Therefore, this study

adds to the stress and coping literature as well as further developing our understanding of the psychosocial factors, such as social support, involved in stress resilience in children.

This research was conducted with populations of healthy children, as it is important to gain a fuller understanding of healthy children's stress responses at different ages before we move on to study ill populations (Gunnar, Talge, et al., 2009) however it does have applications for research with chronically ill child populations. The results of this study could be used to compare healthy children's baseline cortisol levels, along with stress reactivity and recovery to an acute stressor, with the cortisol levels of children with chronic illnesses. Comparisons of healthy and ill populations is essential because previous research has indicated key differences between these two groups in terms of stress responses (Buske-Kirschbaum et al., 1997) and coping strategies (Hampel et al., 2005). For example, Hampel et al. (2005) found that children and adolescents with chronic illnesses demonstrated improved coping with everyday stress compared to their healthy counterparts.

This research can also impact stress reduction and stress management interventions. There are an extensive array of stress management techniques available including medication, behavioural and cognitive methods (e.g. relaxation, biofeedback, modelling, cognitive restructuring, cognitive therapy, problem-solving training, stress-inoculation training), massage, meditation and hypnosis (Sarafino, 2008). The present research has emphasised the importance of having multiple coping strategies to draw on in times of stress, particularly a combination of both individual and collective coping strategies. This finding can better inform interventions aiming to enhance coping as previous research has tended to focus on increasing one main coping strategy rather than enhancing several strategies (Costello & Lawler, 2014; Zenner et al., 2014).

The combined findings of study one and three have suggested that both emotion-focussed coping and problem-focussed coping can be beneficial for reducing cortisol levels when faced with a future stressor, supporting the viewpoint that the type of coping which leads to successful adaptation is situation-dependent (Spirito et al., 1995). Study three also emphasised the importance of social support in dealing with social stressors, a finding that was echoed in participants' narratives in study two, in which social support was more frequently utilised by children in the high resilience groups than in the low resilience groups. Using the findings from this programme of research to design stress-management interventions could be beneficial for both healthy and chronically ill children (as outlined in the previous paragraph). A meta-analysis of medical costs estimated that appropriately

targeted psychological interventions, using some of the psychosocial factors outlined in this research, could reduce healthcare costs by up to 20% (Chiles, Lambert, & Hatch, 1999). Increasing resilience in children with chronic illnesses can also lead to increased medication adherence, which is beneficial for patients and the healthcare system. For example adolescents with type I diabetes who had low resilience scores had higher levels of distress, poorer quality of life, and poorer glycaemic control (Yi-Frazier et al., 2013).

7.8 Summary of the thesis

This thesis has outlined the development and application of an adapted social stress test (the BEST-C) in two populations of healthy children aged seven to 11 years. The panel manipulations employed in the BEST-C (age-matching the audience to the participants and using a pre-recorded video) have not previously been applied to this population. The BEST-C was found to be a meaningful task for inducing a stress response in children due to its use of an age-matched peer audience, although social support was found to be an effective stress-buffer for this type of acute social stress.

This programme of research utilised a mixed methods approach which included the use of innovative interviews with child-parent dyads discussing the topics of stress and the psychosocial processes which lead to resilience. Use of multiple coping strategies and drawing on social support were integral psychosocial factors for differentiating between children with high and low levels of resilience.

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Appendices

Appendix A: BEST-C article published in PNEC (study one)

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Panel Manipulation in Social Stress Testing: The Bath Experimental Stress Test for Children (BEST-C) Tara J. Cheetham and Julie M. Turner-Cobb

Abstract

Background: Whilst acute stress paradigms in adults make use of adult panel members, similar paradigms modified for child participants have not manipulated the panel. Most work has utilised an audience of adult confederates, regardless of the age of the population being tested. The aim of this study was to trial a social stress test for children that provided a meaningful environment using age-matched child peers as panel actors.

Methods: Thirty-three participants (7-11 years) underwent the Bath Experimental Stress Test for Children (BEST-C). Based on the Trier Social Stress Test (TSST), it comprises a shortened six-minute public speaking task and four-minute maths challenge. It differs from previous stress tests by using age-matched children on the panel, pre-recorded and presented as a live feed, and includes an expanded manipulation check of subjective experience. Salivary cortisol was assessed at four time points, pre–post stress testing; life events, daily hassles and coping strategies were measured through questionnaires. A simple numerical coding scheme was applied to post-test interview data.

Results: The BEST-C generated a typical stress and adaptation response in salivary cortisol (p=.032). Age and gender differences were observed during recovery. Cortisol responses mapped directly onto three distinct subjective response patterns: i) expected response and recovery; ii) expected response, no recovery; iii) no response.

Conclusions: The BEST-C, utilising child confederates of participant target age is a meaningful social stress test for children. This is the first social stress test developed specifically

for children that manipulates panel characteristics by using child confederates and a pre-recorded sham panel. Greater cortisol responses to the test were also found to match subjective verbal accounts of the experience. It offers a meaningful acute stress paradigm with potential applications to other child and adolescent age groups. Furthermore, it leads the way in the use of panel manipulation in social stress testing.
Keywords: children, cortisol, social stress testing, panel manipulation, social evaluative threat

1. Introduction

Psychological stressors (threats to the social self or self-esteem) are triggered by social evaluative threat (SET), activating the hypothalamic-pituitary-adrenal (HPA) axis and resulting in elevated cortisol release (Dickerson et al., 2009; Dickerson and Kemeny, 2004; Gunnar et al., 2009). Coupled with lack of control over the environment, laboratory social stress tests such as the widely used Trier Social Stress Test (TSST), have consistently elicited a stress response-recovery pattern in adult populations (Kirschbaum et al., 1993). Yet laboratory social stress testing in children has yielded inconsistent findings (Dorn et al., 2003; Gordis et al., 2006).

The traditional TSST presentation task involves public speaking and mental arithmetic in front of a live panel (Kirschbaum et al., 1993). Twenty years since its inception, modifications and adaptions have included a group style TSST-G (von Dawans et al., 2011), a placebo version (Het et al., 2009), and a 'friendly' version (f-TSST) (Abelson et al., 2014; Wiemers et al., 2013), the latter two resulting in a lack of HPA axis activation. Similarly, focusing on helping others rather than on self-promotion lessens cortisol responses (Abelson et al., 2014).

The presence of a live panel is a key element in social stress testing. However, for practical reasons it may not always be feasible. Use of a pre-recorded, 'virtual audience' circumnavigates this. Dickerson et al. (2008) demonstrated that the link between performance and cortisol response is due not to mere social presence but to SET. A further adaptation of the TSST addressed this using a virtual reality (VR) TSST in which participants performed tasks using a head tracking system in front of a virtual environment (Jonsson et al., 2010). Use of virtual reality is gathering momentum in adult stress testing and is suggested as an effective alternative (Montero-Lopez et al.,

2015; Wallergard et al., 2011). A pre-recorded audience was applied in the Leiden public speaking task with a panel of adolescents in a classroom setting, eliciting a moderate stress response in adolescents aged 12-15 years (Westenberg et al., 2009).

Adaptations to the TSST have also been made to evaluate stress responses in children. The TSST-C adapted the speech (completing an unfinished story) and maths (serial subtraction in 7's) tasks whilst retaining a panel of two adults who gave positive, rather than negative, feedback (Buske-Kirschbaum et al., 1997). The TSST-M modified the speech task component asking children to imagine introducing themselves to a new class, and reduced the duration of the tasks (Yim et al., 2010) but retained an adult panel. Whilst equivalence of the component tasks has been addressed in child stress testing, an age disparity between participant and panel remains.

Evidence for laboratory based social stress testing in children is inconclusive. Most studies of adolescents (aged 13 plus) show an increase in cortisol in response to a stress test but findings for children below this age have been inconsistent: Buske-Kirschbaum et al. (1997), Gordis et al. (2006) and Yim et al. (2010) all found an increase in cortisol; Dorn et al. (2003) found no significant increase; and Westenberg et al. (2009) only moderate responses. In a review of child stress paradigms, Gunnar et al. (2009) report only 12 out of 17 studies using public speaking tasks to show an increase in cortisol production. Explanations for lack of response have been linked to a hypocortisolaemic period in pre-pubescent children (Hankin et al., 2010). Post infancy until early puberty, children show a diminished basal cortisol level and less reactivity to stress (Gunnar and Donzella, 2002). Whilst this may serve an evolutionarily protective function during brain development (Lupien et al., 2009), there is uncertainty surrounding the extent of this hypocortisolaemic state. The reliability of social stress tests to elicit a cortisol response in children under 13 years of age therefore presents an ongoing debate.

In adult stress testing, participants perform in front of an adult panel yet in child stress testing peers have not been age matched, with the exception of work by Westenberg et al. (2009) with adolescents. Performing in front of an adult panel has the potential to create a power dynamic in children that does not exist in adult testing. Removing this dynamic would make the child and

adult stress tests more comparable and ecologically valid since as peer interaction and evaluation is a key aspect of a child's natural environment (e.g. Gunnar et al., 2003).

There is also evidence that underlying chronic stressors or past stressful experiences may influence reactivity in acute stress situations, for example Marin et al. (2009) report a combined effect of exposure to underlying chronic family stress and acute stress events in children with asthma. The complex nature of stressful events, referred to as "compound stressors" (Michaud et al., 2008) is also evidenced in prior life event stress influencing cortisol response to the acute stress of starting school (Turner-Cobb et al., 2008). Long-term memory of prior stressful events appears implicated in acute stress responses (Montirosso et al., 2013) and early life stress (before age 16 years) can negatively diminish acute laboratory stress responses in young adolescents (Lovallo, 2013). Furthermore, coping can act as a moderator in the TSST (Abelson et al., 2014).

The primary aim of the present study was to create a modified social stress test based on the core characteristics of the TSST/TSST-C but with the panel manipulated to address the age disparity with participants. This modified stress test, the Bath Experimental Stress Test for Children (BEST-C), was designed to create a more meaningful environment for children by enlisting children rather than adults on the panel. The BEST-C utilises a pre-recorded child panel delivered via a sham live video link to participants aged 7-11 years. It also includes a post-test interview to assess subjective stress to compare with the objective stress response assessed via salivary cortisol. We hypothesised that children would exhibit an increase in cortisol in response to the BEST-C, followed by post-test recovery. Those reporting more underlying stressful life events, daily hassles, and use of less effective coping strategies were expected to demonstrate greater cortisol reactivity and slower recovery.

2. Method

2.1 Participants

An opt-in recruitment method with advertisements in local newspapers, schools, and sports clubs was used to recruit 33 healthy children aged seven to 11 years old (17 boys and 16 girls). Exclusion criteria included oral steroid medication, chronic mental or physical illness or special

educational needs (SEN). Demographic information such as age, ethnicity, and socioeconomic status (SES) are given in table 1. The three SES factors include parental occupation level, parental education and a two-factor SES score based on the Hollingshead (1975) weighted SES scoring system. The number of participants was derived from a G*Power calculation which suggested a sample size of 32, based on conducting a MANOVA with a medium effect size of 0.3 (as indicted by Yim et al., 2010, findings), an alpha of 0.05 and power of 0.80.

Insert table 1 about here

2.2 Measures

2.2.1 Questionnaires: Demographics, life events, daily hassles and coping strategies

Demographic details and a life events scale were completed by the child's accompanying parent. The demographics questionnaire requested information concerning parental occupation and qualifications (SES factors), and child age, gender, ethnicity, height, weight and BMI. The Social Readjustment Rating Scale (SRRS) is a list of stressful life events that impact health for adults but which has been adapted for children and adolescents (Holmes and Rahe, 1967). This scale is widely used in the literature and was judged to be a good measure of life events in a review assessing its use over 30 years of research (Scully et al., 2000) and the adult version has test-retest reliability of r=.71 over a six week period (Horowitz et al., 1977). It gathers information about stressful life events that have happened in the last year such as death or divorce of parents, changes in acceptance by peers, and hospitalisation of a sibling. Parents recorded a yes or no answer on behalf of their children for each of the 31 items. Space was provided at the end of the questionnaire for participants to include any additional life events not listed that had occurred in the past year.

Assessment of daily hassles and coping styles were completed by the child participant with assistance in reading and writing from their parent as necessary. The Children's Hassles Scale collected information about hassles that had occurred in the last month (Kanner et al., 1987). The scale has been found to have high levels of predictive validity, with more frequent hassles

associated with more emotional distress (Blount et al., 2008) and the adult version of the scale had test-retest averages of *r*=.79 for frequency of hassles and *r*=.48 for intensity of hassles (Kanner et al., 1981). The 34 item scale included hassles such as falling out with friends, being punished for doing something wrong, and having trouble finishing homework. Children were asked to rate whether they felt 'ok', 'quite bad' or 'very bad' if the event had happened to them in the past month; the options were accompanied by pictorial representations of these emotions.

The Kidcope questionnaire for children aged 5 to 13 was used to measure children's coping responses to a specific stressor (Spirito et al., 1988). This scale was found to have high test-retest reliability using Pearson's correlation for all questionnaire items when tested three days apart (range = .56 to .75) and six of the ten items when tested one week apart (range = .41 to .83) (Spirito et al., 1988). The child was asked to first 'think of a time when you had a problem that bothered you' and briefly describe this problem. They were then asked three distress questions: whether the problem made them feel nervous or anxious, sad or unhappy, and cross or angry. Children rated these distress items on a five point Likert scale (from 0 to 4) with 0 being 'not at all' and 4 being 'very much'. Participants were shown a list of 15 coping strategies and asked to answer yes or no as to whether they used these coping strategies to help with the problem they had described. If they answered yes they were asked how much that strategy helped on a three point Likert scale (from 0 to 2) with 0 being 'not at all' and 2 being 'a lot'.

2.2.2 Stress paradigm: BEST-C

The BEST-C was used as the social stress test. Based on the original TSST (Kirschbaum et al., 1993) and the child related modifications (TSST-M) made by Yim et al. (2010) it involves a ten-minute verbal presentation and mathematical challenge in front of a panel who elicit SET by failing to provide positive feedback. The BEST-C does not require the audience to be physically present in the same room as the participant. Participants were informed that the audience is being shown via a 'live video link' that is projected onto a large screen with a webcam visible above it. In reality, the live link was a pre-recorded video of the panel that ensured that each participant received identical feedback. The BEST-C uses a child panel of the same target age group as the child participants.

The verbal presentation task involved the child giving a speech about themselves as if they had started a new school and been asked to introduce themselves to their new class; they were told they could talk about their likes and dislikes and that they had to keep talking for six minutes. If necessary the researcher prompted with open-ended questions until the time was up. The maths challenge was a serial subtraction task in which were asked to count down from 825 in multiples of three, lasting four minutes. If participants made an error they had to start again at the beginning.

The BEST-C pre-recorded video was ten minutes long and showed two children dressed in white laboratory coats (one girl and one boy, aged 8 and 10 years) in addition to the adult researcher who was present in the room. The researcher and panel members were dressed in laboratory coats, in keeping with the environment and the TSST stress testing paradigm. Panel members performed the standard roles assigned in TSST tests, operationalised in the BEST-C as one member of the panel staring intently and taking notes while the other panel member played with a mobile phone, looked bored and yawned. The video was projected onto a screen so the panel appeared life-sized and the researcher sat next to the screen to give the impression of a panel of three people. The researcher gave neutral feedback, asked open-ended questions if necessary during the speech task and led the maths task.

2.2.3 Salivary cortisol sampling and assays

Four saliva samples were collected from participants throughout the stress test using a Salivette® (Sarstedt): i) a pre-stressor sample to capture a baseline cortisol level; ii) a sample 20 minutes after the start of the stress test to assess peak response (Dieleman et al., 2010); and two samples 30 and 45 minutes after the start of the stress test to capture return to baseline (Buske-Kirschbaum et al., 1997). Participants were instructed to refrain from eating or drinking for an hour prior to providing the first saliva sample. Following testing, samples were refrigerated for up to three days before being centrifuged (3000 rpm for three minutes). Samples were then frozen until data collection was complete wherein they were transported on dry ice for commercial testing (Salimetrics, UK). Assays were conducted in duplicate using salivary cortisol enzyme immunoassay (EIA) kits following an established and well-validated protocol with a lower limit of the assay sensitivity of 0.007 μg/dL and the mean interassay coefficient of variability of 6.3%

(determined using duplicate assays of a standard solution of 100 µg/dL cortisol performed using 10 separate plates). Cortisol levels were converted from µg/dL to nmol/l in line with standard reporting values (Jessop and Turner-Cobb, 2008).

2.2.4 Post-test manipulation check: Brief interview

Following the relaxation period, children were interviewed using a structured interview protocol including questions about how they felt before, during and after the task, what it was like doing the tasks, what they were thinking during the tasks, how they had coped and how they felt about the live feed deception. Questions are given in table 2. The interview acted as an elaborated manipulation check to assess the subjective stress experience of the participant to the social stress test and their use of coping strategies. The interviews were audio recorded, transcribed, and self-reported response type coded quantitatively using a simple numerical scheme. Most participants reported feeling nervous before and during the task and relief once the task was over, indicating the normal pattern of response expected to a social stressor. These participants were coded as group 1 (normative response). Some participants claimed to feel stressed after the task had ended, during the recovery period; these participants were coded as group 2 (continued stress). A small sub-sample of participants did not find the task stressful at all; these were coded as group 0 (no stress response).

Further coding of interview responses using Nvivo and analysis using thematic analysis will be reported elsewhere and only the quantitative analysis for these interviews are presented here.

Insert table 2 about here

2.3 Procedure

Testing occurred in the late afternoon to account for diurnal variability in cortisol. Verbal assent from the participant and written consent from the parent were obtained. Parent and child

participants completed their respective questionnaires and height, weight, and body mass index data were gathered by the researcher. Approximately 20 minutes after arriving at the laboratory, each participant provided a baseline saliva sample. On completion of the questionnaires, the researcher verbally explained the stress test, described as a ten minute 'speech and maths task' in front of an audience and allowed the participant five minutes to prepare some notes and ideas for the speech. Parents were able to assist participants in their preparation for a couple of minutes before being escorted to the waiting room to allow the child to spend the last three minutes preparing by themselves.

During the stress test the child was asked to stand in front of the researcher and the on-screen child panel. When the six minute verbal presentation and four minute maths task were complete participants were escorted to the debrief room to re-join their parent. Twenty minutes after the commencement of the stress test (ten minutes from the end of the stress test) a second saliva sample was taken. Participants and their parent were left to relax for a further ten minutes before a third sample was taken. A final saliva sample was taken fifteen minutes later (45 minutes after the beginning of the stress test).

On completion of all samples, participants and their parent were debriefed and made aware of the deception used during the stress test. Participants were then interviewed.

2.4 Statistical analysis

Cortisol and demographic data were analysed using a Multivariate Analysis of Covariance (MANCOVA) in which age, gender and self-reported stress group were entered as IVs, cortisol during and post-test (time 2 and time 3) entered as DVs and baseline cortisol controlled for as a covariate. Follow-up ANOVAs and t-tests examined group effects. Life events were calculated using the Holmes and Rahe (1967) weighting system, hassles were added up to a total score, and coping was split into two factors assessed by the questionnaires (frequency and efficacy) for the three types of coping (problem-focussed, emotion-focussed, avoidant) (Turner-Cobb and Steptoe, 1998). Relationships between the psychosocial questionnaire data were analysed using bivariate correlations.

Data screening identified one outlier across all four cortisol samples, with this one participant displaying consistently higher cortisol levels than the rest of the sample presenting sufficient justification for exclusion from analysis. The final sample size consisted of 32 participants.

3. Results

3.1 Baseline cortisol levels

It was expected that the first sample taken 20 minutes after the participants arrived at the laboratory would reflect their baseline cortisol level. However, mean cortisol levels were found to be significantly elevated at time 1 compared to post-test levels for each of the five age groups, indicating an anticipation effect of the task. This issue of high cortisol baseline measures was recently listed as one of the main challenges in laboratory-based tasks assessing salivary cortisol reactivity in children (Tolep and Dougherty, 2014). To address this, the fourth sample (taken 45 minutes after the beginning of the stress test) was used as a 'proxy' baseline measure (Nicolson, 2008). Baseline substitution has been carried out in other studies, most recently by Abelson et al. (2014) who found that pre-stressor levels of ACTH and cortisol reflected an anticipation effect and so used the mean of two recovery samples (45 and 60 minutes post-stressor) as their proxy baseline measure. The remaining analyses were conducted with these three saliva time points rather than four: a proxy baseline measure; stress reactivity; and recovery (figure 1 displays cortisol means across the stress test).

Insert figure 1 about here

3.2 Self-reported stress

As described in section 2.2.4, participant subjective reports of their perceived stress experience before and during the task and in the recovery period were coded into three groups. When these three groupings were mapped onto the cortisol data over the stress testing period the

following patterns emerged: i) participants who self-reported in the interview that they did not find the test stressful (group 0) did not show the expected increase in cortisol response to the stress test at time 2 (16% of the sample); ii) participants who reported that they found the task stressful but felt better straight afterwards (group 1) showed the expected stress response and recovery pattern of increase post stress followed by a decrease in cortisol (56% of the sample), and iii) participants who reported feeling stressed in response to the task and that they continued to feel stressed afterwards (group 2) showed an increase in cortisol post-test at time 2 and failed to recover as expected at time 3 (28% of the sample. Figure 2 displays the pattern of responses based on self-reported stress and cortisol data. Differences between these three groups were not significantly different across the three time points when data was analysed using a split-plot ANOVA. There was no main effect of time (p = .184) or stress group (p = .628) and no interaction between time and group (p = .697).

Insert figure 2 about here

3.3 Cortisol responses across the BEST-C

Paired samples t-tests showed a significant increase in cortisol from baseline to time 2, $t(31) = -2.29$, p = .029, but no significant difference between baseline and time 3 (p = .103) or between time 2 and time 3 (p = .497). This suggests that the BEST-C effectively elicits an increase in cortisol in this population. There was little difference between cortisol levels at baseline and during recovery, as expected. There was also no significant difference between the reactivity and recovery time points, explained by the age and gender differences in the recovery period (outlined below, section 3.4).

3. 4 Interaction effects between age and gender

Using Roy's largest root, there was a significant age * gender interaction at times 2 and 3, Θ = .1.83, $F(3, 12) = 7.33$, p = .005, (with a strong effect size of η^2_p = .647). Separate univariate ANOVAs on the outcome variables revealed a significant age * gender interaction at time 3, F(3,

12) = 7.07, p = .005, (with a strong effect size of η^2_p = .639) but not at time 2. A follow-up independent t-test for gender (with the file split by age) found that the only age group that had a significant effect at time 3 was 11 year olds, $t(5) = 4.73$, p = .005, and that in this age group it was the boys with the higher level of cortisol.

3.5 Main effects of age and gender on cortisol reactivity (time 2) and recovery (time 3)

The MANCOVA and follow-up ANOVAs demonstrated significant main effects for age and gender but not self-reported stress group. Using Pillai's trace, there was a significant effect of baseline at times 2 and 3, V = .598, $F(2, 11) = 8.18$, p = .007, (with a strong effect size of η^2_p = .598). Separate univariate ANOVAs on the outcome variables revealed a significant effect of baseline at time 2, $F(1, 12) = 5.86$, p = .032, (with a moderate effect size of η^2_p = .329) and at time 3, $F(1, 12) = 15.96$, p = .002, (with a strong effect size of η^2_p = .571).

Using Roy's largest root, there was a significant effect of age at times 2 and 3, $\Theta = 1.76$, $F(4, 12) = 5.29$, p = .011, (with a strong effect size of η^2_p = .638). Separate univariate ANOVAs on the outcome variables revealed a significant effect of age at time 3, $F(4, 12) = 4.72$, p = .016, (with a strong effect size of η^2_p = .611) but not at time 2. A series of follow-up independent t-tests were carried out to compare age groups at time 3. The only age-related difference in cortisol levels at time 3 was between 7 and 9 year olds however when a Bonferroni correction was applied to take into account the multiple t-tests carried out there were no significant differences between age groups.

Using Pillai's trace, there was a significant effect of gender at times 2 and 3, V = .719, $F(2, 11) = 14.06$, p = .001, (with a strong effect size of η^2_p = .719). Separate univariate ANOVAs on the outcome variables revealed a significant effect of gender at time 3, $F(1, 12) = 28.73$, p = .001, (with a strong effect size of η^2_p = .705) but not at time 2. A follow-up independent samples t-test for gender found that boys had higher levels of cortisol than girls at time 3, $t(30) = 3.08$, p = .004. Gender differences in the stress responses pattern can be seen clearly in figure 3.

Insert figure 3 about here

3.6 Analysis of questionnaire data: Life events, daily hassles and coping strategies

Means and standard deviations for the questionnaire data are included in table 1. Bivariate correlations were conducted to examine relationships between life events, daily hassles and frequency and efficacy of the three types of coping strategies at each of the three time points. Life events (coded using the Holmes and Rahe (1967) weightings) were found to be significantly negatively correlated with cortisol levels at time 2 (r=-376, p = .034) and time 3 (r=-419, p = .017) suggesting that participants with more major life events had lower cortisol levels. Daily hassles were not found to be correlated with cortisol levels at any of the three time points. A one way ANOVA comparing the number of life events and daily hassles in each of the three self-reported stress groups was non-significant for life events (p = .345) and daily hassles (p = .711).

Correlations examining the frequency of the three coping strategies (problem-focussed, emotion-focussed, and avoidant) and cortisol levels showed a significant negative relationship between frequency of emotion-focussed coping and baseline cortisol (r = -.367, p = .039) and between frequency of emotion-focussed coping and cortisol levels at time 2 (r = -.381, p = .031) suggesting that participants who more frequently used emotion-focussed coping strategies had lower cortisol levels at baseline and time 2. There were no significant correlations between the efficacy of the three coping strategies and cortisol levels at any of the three time points. A split-plot ANOVA comparing the frequency of the three coping strategies (within subjects factor) in each of the self-reported stress groups (between subjects factor) showed no significant effects between the three groups (p = .399). Similarly, there were no significant differences between the three self-report groups in relation to efficacy of the three coping strategies (p = .596).

4. Discussion

4.1 The BEST-C as a meaningful task for inducing a stress response in children

Findings from the present study show support for the BEST-C as a meaningful social stress test appropriate for use in children aged 7-11 years. Based on traditional stress paradigms, this adapted child stress test includes a panel manipulated to directly address the participant

characteristic of age. It uses a pre-recorded panel and also includes a post-test interview of subjective experience. Overall, a significant increase in cortisol was observed across the whole sample twenty minutes after the commencement of the stress test. A decline in cortisol was observed post-testing, however due to age and gender differences during this recovery period the reduction in cortisol was not significant. Intragroup examination revealed three distinct response groupings that mapped directly onto subjective reports surrounding stress testing and post-task adaptation. The BEST-C was shown to elicit both a physiological (cortisol) and psychological (self-reported experience) stress response supporting its application and efficacy for use with child participants.

Results provide convincing evidence in the on-going debate surrounding the ability of social stress tests to reliably elicit cortisol reactivity in children. Support is given to studies that report an increase in cortisol in response to a meaningful stressor in children under the age of 13 years (Buske-Kirschbaum et al., 1997; Gordis et al., 2006; Yim et al., 2010). Despite childhood being a period of relatively low cortisol compared to the post pubertal period, inability to elicit a cortisol response in previous research may have been due to the appropriateness of the test design rather than solely to the presence of this hypocortisolaemic period. This result suggests that the combined public speaking and cognitive task were successful at inducing a cortisol response due to inclusion of stressor characteristics, uncontrollability and SET (Dickerson and Kemeny, 2004). Features of SET identified in interview were a definite fear of the child panel and reports of not wanting to "perform badly" or "look silly" in front of an audience.

4.2 The impact of life events, daily hassles and coping strategies

Participants reporting more stressful life events, daily hassles and less effective coping strategies were expected to be slower to recover post task. However, the experience of more stressful life events in the past year showed lower levels of cortisol at post-test (times 2 and 3) and no significant effect of daily hassles on cortisol levels. This suggests that prior life stress may be protective of sustained reactivity to a subsequent acute social stressor. This finding is in line with work reported by Lovallo (2013) in adolescents with prior life event history. Unlike this previous

work, we would interpret our finding more positively, as those faced with past stressful acute life events having learnt effective ways of coping, which they were able to draw on during acute social stress.

As predicted, there was a significant relationship between frequency of emotion-focussed coping strategies and cortisol levels at baseline and post stress (time 2). Lower levels of cortisol at these time points were associated with more frequent use of emotion-focussed coping, indicating that its use was protective under acute stress. The theoretical implications of the present study extend to the well accepted transactional model of stress and coping (Lazarus and Folkman, 1984). As nothing can be done to change the stressor during this experimentally confined context the only option available is for the child to regulate their feelings towards the

Whilst emotion-focussed coping is often seen as having less positive outcomes (Compas et al., 2001) these results show the importance of context in defining the adaptability of the response.

4.3 Age and gender differences in the recovery period

Significant main effects and interactions occurred at time three, the second post-test assessment, 30 minutes after the commencement of the stress test. The sample were relatively homogenous in their reactivity to stress as indicated by cortisol levels at time two (20 minutes after test commencement) but showed differences during the post-test recovery period. Boys revealed higher levels of cortisol than girls during recovery, suggesting that girls adapted more readily and boys continued to experience stress after the task had ended. This pattern could be explained by less frequent use of emotion-focussed strategies in boys during the stress test, as seen in other studies (Connor-Smith et al., 2000).

4.4 Self-reported stress levels mapped onto cortisol data demonstrating three distinct patterns of stress response

An unexpected, secondary finding in this study was that children's subjective reports of the BEST-C stress experience, as described in post-test interview, matched their cortisol response patterns. Children were able to identify how they felt before, during and after the stress test and this very accurately corresponded to the objective assessment of their stress as assessed by salivary cortisol. It is unusual for self-report to match fluctuations in biological data such as cortisol,

particularly in adult samples. Other work with children has found that although self-report of stress levels during the TSST was very accurate, it was much less so pre- and post-stressor (Hellhammer and Schubert (2012). We would suggest that children may have a more intuitive awareness of their feelings of stress, be more honest about their negative feelings and more willing to share those feelings with the researcher than adults may be.

That not all children had the same pattern of response and adaptation is in accord with work by Smyth et al. (1997). Of most concern are not those who responded to stress but failed to adapt post-task or failed to respond to the stressor. Such patterns indicate early development towards allostatic profiles that may potentially be detrimental to health if subsequently continued and reinforced (McEwen and Stellar, 1993).

4.5 Strengths and limitations

There are many positive aspects of the present study, such as its novel development of an adapted stress test in which the panel rather than the participant or task was manipulated. The use of a pre-recorded audience proved to be a successful adaptation for children, as in research with adolescents (Westenberg et al., 2009). The current study was conducted in an experimental setting and a mixed methods approach taken that provides a more complete picture of the impact of social stress testing. However, we acknowledge a number of limitations. Firstly, the small sample size. Although a power calculation determined 33 participants to be appropriate, this was minimal and a larger sample would have enabled more confidence in the generalizability of the findings. Issues of protocol relating to the baseline measure provided another limitation. Whilst stress testing protocol recommendations were followed, taking the initial baseline sample 20 minutes after the participant arrived at the laboratory to enable time to adapt to the novel environment and researcher (Gunnar et al., 2009), this was not sufficient to obtain a baseline assessment. Children showed a higher than expected response at 20 minutes after arrival, despite efforts to minimise this novelty effect, and we captured an anticipation period rather than a baseline assessment. Stress anticipation could have been due to a number of factors, including uncertainty or worry about the research nervousness about going to a new place and meeting a stranger, or to events outside of the laboratory including a stressful journey and difficulty finding the laboratory. We addressed this by using the fourth

sample taken at 45 minutes after the onset of the stressor as this represented the recovered cortisol state post-testing and hence provided a useful proxy measure of baseline cortisol. We would draw attention to the need for sufficient laboratory time prior to baseline assessment to obtain a true baseline and the particular relevance of this in child stress testing. Some researchers have obtained a baseline away from the laboratory in the child's naturalistic environment a day or more prior to the laboratory stress test (Hostinar et al., 2015; Lovallo et al., 2010). In future work we would endorse this approach to minimise time required in the laboratory and to obtain a truer baseline uncontaminated by anticipatory stress effects.

4.6 Future research

The present study has found initial evidence for the BEST-C as an effective tool for inducing a cortisol response in 7-11 year old children. Replication and further validation is needed with a larger sample size. Correlation between lower cortisol levels and higher numbers of stressful life events was unexpected and requires further investigation. Gender differences found in cortisol levels during the reactivity and recovery periods, as well as their relationship with coping strategies, particularly emotion-focussed coping, warrant further attention to tease out the psychosocial factors that could improve children's stress responses. Since not all children responded to the stress test in the same way, future work is called, focusing on individual differences, to explain differential coping with acute social stressors. Further methodological issues also require further testing, such as the impact of having an adult as the panel lead compared to using an older child trained in this role, to enable differentiation of panel versus experimenter effects. Findings could help with the design and implementation of stress-reduction or coping strategy enhancement interventions.

4.7 Conclusions

This is the first stress test to use child confederates on the panel and the first to use a pre-recorded video as the panel audience in a pre-adolescent child stress test. The present study has confirmed the effectiveness of the BEST-C as a social stressor for children aged 7-11 years. Age and gender differences found in the stress recovery period are findings relating to coping strategies highlight emotion-focussed coping as a useful strategy under acute social stress. The BEST-C also

used an innovative mixed-method approach including interview of subjective experience that was coded numerically and analysed in conjunction with the cortisol data, demonstrating that children were accurate in their assessments of their feelings towards stress as their responses matched their biological response to stress. This secondary finding provides convincing support for some of the key stress and coping theories. The BEST-C is the first stress test to use children of the target age group 7-11 years on the stress panel in conjunction with a pre-recorded video presented to participants as a live feed to ensure consistency of panel response. It offers a meaningful acute stress paradigm with potential applications to other child and adolescent age groups for investigating relationships between stress, coping and health outcomes.

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Appendix B: BEST-C prompt questions (study one and study three)

Introduction to the BEST-C task

(script read to participant by researcher)

"Imagine you're in a new class with about 20 other students and that your teacher has asked you to stand in front of the class and introduce yourself. You can talk about yourself, your personality, and why you would be liked by the other students in the class. You can also talk about one good and one bad thing about yourself."

You will be giving the talk in front on a panel of your peers who will listen and take notes.

The video camera is there so that experts can watch it later and analyse your body language.

You have three minutes to prepare.

Prompt questions for speech task

You still have more time.

Could you tell us more about that?

What kind of activities do you do after school? E.g. any sports, music?

Do you have any other hobbies?

What do you do at the weekend?

Do you go to the cinema? What kind of films do you like?

What kind of books do you like?

Do you have any pets?

Appendix C: Health questionnaire (study two)

1. How would you assess the health of your child currently?

	In the past month	**In the past 12 months**
Very healthy, no problems		
Healthy, but a few minor problems		
Sometimes quite ill		
Almost always unwell		

2. In **the past 12 months** have you had to visit a GP or go to the hospital because your child was ill?

Yes		If **yes** please state how many times:
No		

3. Has your child been admitted to hospital **in their lifetime**?

Yes	
No	
If yes how many times?	

Please describe the reason for hospital admission……

4. Has your child had any of the following in **the past 12 months**?

	Yes and saw a doctor	**Yes but did not see a doctor**	**Did not have**
Diarrhoea			
Vomiting			
High temperature			
Ear ache			
Convulsions/fits			
Stomach ache			
Rash			
Wheezing			
Breathlessness/trouble breathing			
Headache(s)			
Asthma			
Eczema			
Hay fever			

Other (please tick and describe)			

5. In **the past 12 months** has your child had any of the following infections?

	Yes	**No**
Measles		
Chicken pox		
Mumps		
Meningitis		
Cold sores		
Whooping cough		
Urinary infection		
Eye or ear infection		
Chest infection		
Tonsillitis/laryngitis		
Influenza (flu)		
A cold		
Other infection (please tick and describe)		

6. How many days has your child had to take off school for health reasons?

	In the past month	**In the past 12 months**
Number of days		

Please describe the reason for school absence……

7. Are there any pills, ointments or medicines that your child has taken every day or nearly every day for the last 3 months? (Include vitamins, skin cream, inhaler, antibiotics, antihistamines, homeopathic and herbal remedies etc.)

Yes	
No	

If yes, please describe:……

8. Does your child have any allergies? (E.g. foods, drinks, pollen, animals, bee/wasp stings, house dust, medicine etc.)

Yes	
No	

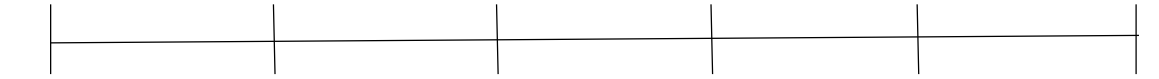
If yes, please describe:……

Appendix D: Personality scale (study two)

About you: personality

1. Is your child's mood generally negative or positive?

2. How sociable is your child?



3. How does your child respond to stressful events?

4. Would you say your child is vulnerable or resilient to stress?

Appendix E: Illness scale (study two)

1. Who did the illness have an impact on?

Just the child — The whole family

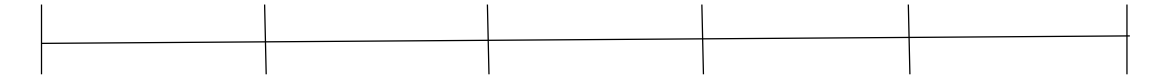
2. How serious was the illness?

Mild — Severe

3. How long did the illness last?

Short term — Long term

4. What was the onset of the illness like?

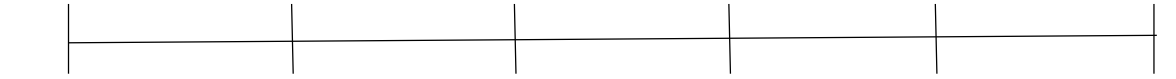


Gradual — Sudden

5. How much control did you feel you had over the illness?

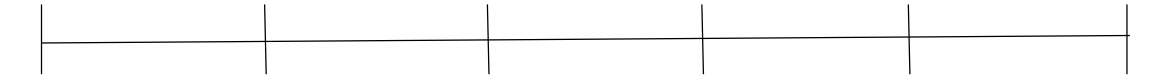
Manageable — Unmagaeble

6. How predictable was the illness? Predictable or uncertain?



Predictable — Uncertain

7. How demanding was the illness on your resources?



Small — Great

Appendix F: Interview protocol (study two)

Purpose of the research and ethical information (directed at the child):

I'm Tara and I work as a researcher at the University of Bath. I'm interested in learning more about how children cope with challenging events, especially stressful situations that people have experienced and how they felt about them.

In the questionnaires we asked you and your *mum/dad* for information about any stressful life events which you have experienced, any illnesses you have had and how you cope when bad things happen. Now I'm going to ask you a few questions about some of your answers to the questionnaires and you and your *mum/dad* can tell me about any other challenges you've experienced. There are no right or wrong answers; we are just interested in your experiences and feelings.

The talk we're going to have will cover five topics (similar to the questions you've already answered): about you, life events, coping, illness, and early life experiences. Some of the questions will be for you, some will be for you *mum/dad*, and some of them you can both answer. The talk should last between 45 minutes to an hour.

Just to remind you that this *(show audio recorder)* will be recording our conversation but I will be the only one who listens to it. I will give you a different name when I write about this talk so your name will be kept private/secret. If you want to stop the talk at any time you can do and you do not have to give a reason. Are you happy to continue?

1. About you:

Before we begin could you tell me a bit about yourself and your family?

Prompts: Who do you live with? Has this changed since you were little?

What kind of things to do like doing at the weekend?

What subjects do you like at school?

What are your hobbies/things you like doing?

Personality: Use personality scale

2. Stressful life events and daily hassles:

For stressful life events: You mentioned that *(type of event)* happened. Could you describe what happened?

How did you feel about *(the event)*?

Could you describe to me how stressful *(the event)* was for *(the child)/*the family?

Prompts: Length of the event?

Coping: Could you describe how you dealt or coped with *(the event*)? E.g. what did you do to make yourself feel better?

How do you think *(your child)* coped with *(the event)*?

Comparisons: Could you compare what you felt like before *(the event)* and how you feel now? E.g. compare how you felt about school/relationships with friends/family before and after *(the event)*

Could you compare *(your child's)* feelings/behaviour before and after *(the event)*?

Effect on present life:

Could you compare how *(your child)* deals with new challenges or problems before and after *(the event)*?

Could you describe how *(your child)* reacts if they are reminded of *(the event)*?

Prompts: Interference with day-to-day life?

For daily hassles: You said that *(type of hassle)* made you feel *(okay/quite bad/very bad)*. Could you tell me a bit more about the hassle/how it made you feel?

Prompts: Are there other times when you've felt similar to that?

What do you mean by…?

Open the discussion up to any other relevant life events (be guided by the participant and use the above questions): Are there any other stressful events that have happened to you that we've not talked about?

Prompts: How old was *(your child)* when this happened?

3. Coping:

When you told me about you coped with that problem on the coping questionnaire you said that you found *(top three strategies)* most helpful.

Go through each strategy in turn: Could you tell me about any other times you've used this strategy?

Can you tell me how you normally cope with problems? What do you normally do if something bad happens to you?

Prompts: Can you tell me a bit more about that? Do you use any of the things on the list? Can you describe a time when you've used this strategy? Can you describe how you feel once you've used them?

4. Health and illness:

Can you tell me a bit about what it's like to be ill?

On the health questionnaire you said that *(your child) (go through each question e.g. had some health problems)*. Could you tell me a bit more about that?

For each specific illness: Use health and illness scale

5. Early life events:

Were there any stressful events that happened to you during your pregnancy?

Were there any stressful life events that happened to you or *(your child)* during the first year of their life?

Prompts: How did these events make you feel?

Closing questions:

We're almost done now. I've asked lots of questions on this topic, but is there anything I've missed or not asked that you think is very relevant or important.

I think that's everything I wanted to ask you, so do you have any final questions or comments?

Thank you both very much for your time and willingness to answer my questions. It really helps with our research. The interview is now over so I will switch off the recording device.

Appendix G: Saliva assay instructions (study three)

The saliva samples were defrosted and centrifuged at 4000 rpm for 10 minutes before being weighed (so salivary flow rate could be calculated) and transferred from the collection tubes equally into two Eppendorf tubes (one tube for cortisol analysis and the other refrozen in case of further analysis).

Procedure (steps 1-11 taken from Salimetrics booklet and details at each stage added after cortisol assay training with JT)

- Get the assay kit out of the fridge. Everything in the kit needs to be at room temperature (take an hour to an hour and a half).
- Half an hour later, defrost the saliva samples (takes 15-30 minutes).

Step 1: Determine your plate layout on paper and then lay out samples to match it on the large plate (see diagram in booklet).

Step 2: Remove any extra rows you do not need. Tape down the rows at the top and bottom and draw on lines dividing the duplicates. Label the plate lid with layout.

Step 3: Pipette 24 mL of assay diluent into a disposable tube and label it. Set aside for use at step 5.

- Label a disposable tube with assay and space to tick when conjugate is in. Use the gun-like pipette and a 10 mL (long glass) pipette. The top button of the pipette draws the liquid out, the bottom button squirts it back out.
- Draw out 10mL, 10mL then 4mL and put it into a labelled disposable tube.

Step 4: Pipette 25 µL of standards, controls and unknowns (in duplicate) into appropriate wells. Pipette 25 µL of assay diluent into G1 and G2 (zero).

- Use the 200 µL pipette (rather than the 20 µL) as we need 25 µL (always use the smallest one possible for the amount you need). Twist the top to set it to 25 and click down.
- Use yellow or white pipette 200 mL tips. Change the tip for every sample (tap them to make them stay on) and use leaver to remove tip.
- Hold the plate lid in position over intended well to guide where to place each sample.
- The pipette button has two stopping points you can feel (1 and 2). When using the pipette keep it upright, press the button to the 1st stop, place it in to the sample, release the button slowly, and dispense the sample with the pipette touching the bottom side of the well (press the button slowly through 1 then lift up slightly and press 2). **Do not lift thumb up until away from the samples to avoid sucking them back up.**
- Use the vortex machine to mix up the standards and the unknowns just prior to use – hold each sample against the vortex for a couple of seconds.
- Put 25 µL of the standards into A1/2 to A3/4 (including assay diluent into G1, G2 to act as 0 - from an Eppendorf tube decanted from the assay bottle, not from the pre-prepared tube).
- Put 25 µL of each saliva sample into the wells in duplicate.
- Move the used bottles across one well to the left on the big plate to help you keep track of where you are up to. It helps to follow it on the sheet as well.

Step 5: Add 15 µL of the conjugate to the 24 mL of assay diluent prepared in step 3. Pipette 200 µL into each well using a multichannel pipette.

- Vortex the conjugate and tap hard on the table.
- Use the 20 µL pipette to get 15 µL of the conjugate into the assay solution. When you pipette the conjugate make sure the pipette is not touching the bottom or the sides of the tube but is taking the sample from the middle. Flush the pipette a few times with assay to make sure that all the conjugate is out.
- Wash and dry ELISA tray. Use the vortex to mix up the conjugate and the assay for a few seconds. Pour into the ELISA tray.

- Pull out and twist the top of a multichannel pipette to select setting 200. Push button to 1, place into the tray and release button to collect sample. In the wells, going right to left one row at a time (using the plate lid to guide you), rest the pipette on the side of the wells and press 1st and 2nd stop.
- When the assay and conjugate are added to the wells they will turn from clear to pink.

Step 6: Mix plate on rotator for 5 minutes at 500 rpm and incubate at room temperature for 55 minutes.

- The plate rotator needs turning on and setting to the right speed using the dial (can turn off timer and use phone to time for five minutes).
- Mark used samples in red pen and refreeze.
- Throw used assay into the sink and wash tray.
- Leave the plate on the side with a stopwatch to incubate for 55 minutes.
- Set up plate washer.

Step 7: Wash the plate 4 times in the plate washer with 1X wash buffer.

- Use 50 mL of wash buffer and 450 mL of distilled water in a clean measuring glass. Collect the wash buffer using the gun-like pipette and a 25 mL long glass pipette.
- Pour wash solution into 'buffer A' bottle for use by the wash machine and label.
- The protocol is called 'cortisol salimetrics', click 'ok' to select the protocol. Select each strip for washing and remove wash for missing rows and click 'prime', 'start' then 'start' again.
- Uncover plate, throw samples into sink in a quick motion and place plate in washer.
- Plate washer takes less than five minutes to do four washes.
- Bang the plate on a towel and soft surface (e.g. lid of a polystyrene box) until dry. The parts we want will have bound to the plate.

- Empty out waste bottle and old wash buffer. Wash out the bottles with tap water then distilled water and press ‘prime’ a few times with distilled water in ‘buffer A’ bottle to clean the plate washer. Turn off plate washer when finished.

Step 8: Add 200 µL of TMB solution to each well with the multichannel pipette. TMB is light sensitive and develops the colour.

- TMB is light-sensitive so is in a brown bottle.
- Rinse and dry substrate tray and add TMB solution to below the 25 line.
- Use a multilevel pipette with 200 mL tips to put 200 ml into every well (they will slowly start to turn blue).
- Wash substrate tray.

Step 9: Mix plate on rotator for 5 minutes at 500 and incubate the plate in the dark at room temperature for 25 minutes.

- Put the cover back on the plate and put on the rotator and time for 5 minutes.
- Incubate in a drawer or cupboard.
- Turn on computer and the plate reader.

Step 10: Add 50 µL of stop solution with a multichannel pipette.

- Wash and dry acid tray.
- Change multichannel pipette from 200 to 50 mL.
- Use 200 mL pipette tips to add the stop solution to each row (right to left) using the plate lid to guide you (they will turn yellow).
- Wash and dry acid tray.

Step 11: Mix the plate on rotator for 3 minutes at 500 rpm. Read in a plate reader at 450 nm. Read plate within 10 minutes of adding stop solution.

- Mix plate for 3 minutes.

- Wipe the underneath of the plate until dry. Click ‘open’ on the plate reader and place the plate into it. Click on the plate reading software (Spectrostar)
- **Remember to remove plate after reading, throw contents into the sink and put plate in biological waste bin (with gloves etc).**

Spectrostar plate reader and Mars v2.41 data analysis software

- Log onto computer and click on Spectrostar icon.
- Click ‘saliva cortisol’ analysis button and you will hear plate reader start to scan. When it stops click on the other saliva analysis JT has set up: ‘sal cort 450-630’ and scan.
- When both scans have run click on the Mars icon to get the statistics (when prompted as to which file open do the first scan and follow instructions below then do the same for the second scan).
- Look at microplate values (check duplicates are close and that standards are what they’re supposed to be).
- Click on wizard and select ‘4 parameter fit’ with linear values and look at the standard curve.
- Click ‘export to excel’.